Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. ROB'T MCKEAN, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 31—Berlin N. W. 7.

WALTER RENTON INGALLS, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engmnjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

STATEMENT

of the ownership, management, etc., of THE ENGINEERING AND MINING JOURNAL, published weekly at New York, N. Y., required by the Act of August 24, 1912.

Editor, Walter Renton Ingalls, New York, N. Y.

Managing Editor, Richard H. Vail, New York, N. Y.

Business Manager, W. LeBaron, New York, N. Y.

Publisher, Hill Publishing Company, New York, N.Y.

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(My commission expires Mar. 30, 1913)

The Engineering and Mining Journal

Vol. 94 OCTOBER 12, 1912 No. 15

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*Illustrated

A new law requires newspaper publishers to file with the Post Office Department, under oath, a list of their editors and stockholders, and publish the same in their papers twice yearly. The legal notice for the ENGINEERING AND MINING JOURNAL will be found on this page. We are glad to furnish the list of stockholders for the benefit of some busybodies, who often accuse us of being owned by the Smelter Trust, the metal dealers or what not.

All of the five engineering weeklies of the Hill Publishing Co. are owned by the persons named, and by no others. All but two of these stockholders are employees or ex-employees, and the exceptions are the wife and daughter of the president.

Every member of the Hill Publishing Co. has a bread-and-butter-hold-my-job interest in the straight, square conduct of the company, aside from its possible earning of dividends. Of course, Mr. Hill, owning the controlling interest, is personally responsible for the good or ill these papers do—that's all the trust ownership there is.

The Price of Silver

The price of silver not only maintains its recent high level, but has even advanced a little. The immediate cause of the advance is the fact that the Indian Government has found it necessary to increase its depleted reserve of silver rupees, and has made considerable purchases for coinage. The Indian people are generally prosperous and the demand for silver currency has been large. Silver is still the money required by the great body of the people, notwithstanding the increase of gold imports and the apparent greater use of gold for purposes of accumulation. It must be remembered that gold is available only for a comparatively small part of the people, and that most of them are not able to extend their savings beyond the silver limit.

Moreover, customs change slowly and it will take a long time to eliminate the traditional preference for silver. Besides the Indian purchases there has been recently considerable buying for European countries and notably for Russia, which has found use for silver not only in coining rubles for home use, but also in its possessions and commerce in the Far East.

American Institute of Mining Engineers

The meeting of the members of the American Institute of Mining Engineers on Oct. 7 reminded us of the Duke of York's army of 10,000 men which marched up the hill and then marched down again. After much solicitation of proxies, circularizing of members, etc., no use was made of them. It is understood that Mr. Eilers held about 900 and Mr. Corning about 300 proxies.

The only definite accomplishments at the meeting were the withdrawal of the three pending amendments to the constitution and the discharge of the Committee of Five, with thanks, compliments, etc.

A long series of amendments to the constitution and by-laws was introduced, amounting in effect to a rewriting of both these documents, but without effecting any alteration in the present bad system of government. The drafters of these amendments assumed that the dual existence of the board of directors and the council must continue and specified a lot of details to tie them up in rectitude. If anything it is proposed to make the council a more purely honorary and inactive body than heretofore. In order to avoid there being two presidents of the Institute, it is now proposed to call the leader of the council a chairman. Well, even the Japanese made a distinction between the Mikado and the Tycoon.

Why it should be assumed that because the American Institute of Mining Engineers is incorporated under the laws of the State of New York it must have two governing bodies passeth our understanding. The Mining and Metallurgical Society of America is incorporated under the laws of New York but has not encountered this necessity; nor has the American Society of Civil Engineers; nor the Mechanical Engineers; nor any other society that we ever heard of.

The Institute needs a single, concentrated, responsible government, and we believe that is what its members want. If they could have a chance they would no doubt like to have the opportunity to express that idea in principle and let a committee draft the necessary constitutional amendments in the leisure of the study. Constitutions cannot be written in general meetings. The unanimous vote in favor of Mr. Moore's resolution at the meeting on Oct. 7 was an index of what the members want.

The controversy that has been going on in the Institute has had at least one good effect, i.e., it has awakened more interest than has been displayed in it in a long time. The organization that was thought even to be moribund has come to life again. However, the controversial questions that have been introduced up to date have been singularly characterized by the absence of broad constructive thinking.

The Bingham Strike

The conditions governing the strike at the Bingham, Utah, which affects chiefly the Utah Copper Co., are economic rather than arbitrary, which means that the personalities of Mr. Jackling on one side and Mr. Moyer on the other are trifling in comparison with the working of the great economic law of demand and supply. The miners at Bingham were getting $2.50 per day. The copper mining companies, in common with those of the rest of the country, have been enjoying great prosperity for nine months or so. Most of them had voluntarily made liberal advances in wages in order that their employees might share in their prosperity.

The Utah Copper Co. was not so generous and waited until a demand for an increase had been made. Then it offered 25c. per day, which was not enough. The strike ensued and the introduction of the question of recognizing the union. In the meanwhile many of the men have left Bingham for other fields of employment. Any man who can work can get a job nowadays. In the railroad camps in the Rocky Mountain region men are being paid $2 per day and their board, which is better than $2.75 per day and board to pay. Even at equal terms, we do not wonder that anybody would rather go to anywhere than stay in Bingham, which is the most repulsive mining camp that we know of in the United States. We do not deprecate its unfortunate inhabitants, but refer rather to its physical conditions, which are uncomfortable, forbidding and unsanitary. Bingham has been most fittingly described as "A sewer four miles long."

Mr. Jackling and his fellow managers should give consideration to this in the adjustment of their rate of wages. We know that the men who work in open quarries, as at Bingham, shifting track, shoveling, etc., in the daylight, are not necessarily of the same class as the craftsmen who drill, blast and timber underground, but if they can get more money in daylight work on the railways than in the Bingham quarries they will go to the railways, and no persuasion will keep them in the quarries. This is economic law. Recognition of the union is merely a subordinate issue.

The strikes at Bingham and Ely will reduce the production of copper after the smelters have worked up their stocks of concentrates, which has not yet happened. If the strikes are soon settled the mines can no doubt replenish the smelters' bins without very much trouble. If, however, the strikes be prolonged there may be a diminution in the intermediate supply of copper which will make the smelting and refining outputs for the year more nearly alike and may enable the boomers to get away with the bluff that they have carried on for so long a time. When the smelting production was exceeding the refinery output we were brazenly assured that no such thing was taking place, and could not possibly take place.

The copper refiners' statistics for September may be accepted as showing two things, viz.: (1) The refinery production is now running at about the same rate as the smeltery; (2) the huge deliveries of a month or two back represented anticipatory buying by manufacturers or speculators, or both.

It is interesting to know that the Cananea company has adopted the Great Falls type of vertical converter, basic lined, to replace the old and ordinary type of horizontal converter. Vertical converters will also be installed in the new smelting works of the Arizona Copper Co. and of the Calumet & Arizona company.

By the Way

The use of coal ashes in mine examinations and the recommendation as to purchase of the coal mine, as described on this page last week, should be credited, writes Professor Munroe, to A. Chester Beatty.

It is to be the Southern Aluminium Co., not Aluminum. This is in deference to the wish of Doctor Heroult, who, like Prof. J. W. Richards, prefers the European spelling. However, the product will no doubt be bought and sold as aluminum, which is the generally accepted term in America.

The demand for gold seems to be urgent in all the leading commercial countries. The Bank of England and the Bank of France are adopting measures to prevent the export of gold, which both wish to avoid. Its transfer as the representative of capital, however, depends largely on the question of the interest which it can earn, and it is likely to go where it is wanted.

A certain large mining company tried to cut down its expenses by shanking its air-hammer drill steels in its own machine shop. The method employed was to cut down the diameter of the steel where the shank was to be, thus leaving a shoulder, then shrinking and rolling on the shank. As may be supposed, these either broke off or twisted loose, when put in the drill. A good drill sharpener would have done the work faster and more cheaply.

A few weeks ago the newspapers made a good deal out of some rails of remarkable durability on the New Haven road, which upon analysis were found to contain about 0.5% copper, and immediately the statisticians of the copper boom began to figure a wonderful new use for copper, which would cause the specter of the delayed and increasing surplus of copper to be forgotten promptly. Thus, for the United States alone 3,000,000 tons of rails at 10-lb. copper to the ton. It is easy to scribble. In fact, rails containing about 0.5% of copper have been used on the Pennsylvania road for a long time. Out of some ore it is impossible to make steel without a copper content. These rails seem to have been neither better nor worse than others. Anyway, they have never attracted especially the attention of the experts of the Society for Testing Materials.

One of the interesting features of the American Iron and Steel Institute meeting at Pittsburgh, Oct., 25 and 26, will be the display by Rogers, Brown & Co., of a series of moving pictures illustrating the principal operations from the mining of iron ore to the production of pig iron and steel ingots. Views of the large open-cut workings of the Mahoning mine at Hibbing, Minn., show the steam shovels actively engaged in stripping and mining operations. The methods of transporting the ore from mine to furnaces, including the handling of the ore at the shipping docks at Duluth and the receiving docks at Buffalo, will be shown. Views of the works will present the methods of stock-piling, charging the furnace, preparing the pig molds, casting pig iron and sampling. The essential operations in manufacturing Bessemer steel will also be illustrated.

Kamloops, B. C. celebrated its centenary on Sept. 17, 18 and 19, 1912, a part of the proceedings consisting of a historical pageant, dealing with the march of events from 1812 on. Of this pageant, no little part dealt with the Fraser River gold-mining days, of which many survivors reside in British Columbia or are scattered through the mining regions of the north. The Minister of Mines of British Columbia (also the premier) Sir Richard McBride, had a pamphlet prepared for distribution, primarily among the old timers, which at the suggestion of the deputy minister was called "The Days of Old and Days of Gold in British Columbia." The pamphlet is illustrated with Fraser and Cariboo River views, and Cariboo mining scenes, including several old ones—in particular, the "Cameron Claim, William's Creek, 1863," and "Old Black Jack & Burns Hydraulic, 1863."

At the Morro Velho mine of the St. John del Rey Co. in Brazil, ore is now being taken from the 17th level, which is 4900 ft. vertical depth below the surface. This does not equal the depths attained by the Tamarack and the Calumet & Hecla copper mines; but it makes the Morro Velho the deepest gold mine in the world, exceeding by 300 ft. the Victoria Reef at Bendigo, Australia, which has a shaft down 4600 ft. Moreover the Morro Velho expects to open next year the 18th level, at 5200 ft., and has plans for opening four additional levels, the 22d to be at 6500 ft. depth. In the Transvaal the greatest depth yet reached is in the Milner shaft of the Simmer Deep, which has been sunk 2900 ft. vertically and 3220 ft. on the incline, the bottom of the incline being 4850 ft. below the surface. The Cinderella Deep is down 3950 ft. vertical and 1160 ft. on the incline, to 4580 ft. below the surface.

The "Lost Spaniard" mine (name slightly changed, this time) has been discovered again. According to a Muskogee, Okla., dispatch, Dan Bellchamber, an enginedriver of the Missouri, Oklahoma & Gulf R.R., believes that he has discovered "the famous Lost Spaniard mine, for which prospectors and investors have been looking for the last quarter of a century, etc." He has procured a mining lease on a 20-acre tract of land, near Bromide, Okla., and has "let in" many of his friends, all of the stockholders being railroad men. The situation of the mine was, of course, found from an old Indian, and the mine "is supposed to date back to the days when the Spaniards from Mexico made frequent trips to this country." The new company that has been organized is aptly named the Mystery Mining & Milling Co. The shaft of the mine is reported to be about 27 ft. deep, and we presume that is part of the mystery of how laymen are induced to buy mining stock. The shaft, it is stated, has caved and the timbers have rotted, but enough ore projected so that a party of 20 railroad men who visited the mine were able to procure nice samples, which are reported to assay 200 oz. in silver and 63% lead. We presume they were so excited when they returned from this examination, that like the girl in "Ready Money," instead of taking time out to go to lunch, they wished to "wait right there at the company's office and watch the stock go up."

The Research Corporation, the workings of which were described by F. G. Cottrell before the International Congress of Applied Chemistry, represents another effort to bring academic research nearer to commercial needs. It will be remembered that Mr. Cottrell at one time proposed to give to the Smithsonian Institution all rights to his own inventions in electrostatic fume condensation, except the foreign rights, those in six Western states, and those of one portland-cement corporation. The Institution, however, thought it inadvisable to become the direct owner of royalty-bearing gifts, so the Research Corporation was chartered to administer this and any similar donations. The stock is non-dividend paying, $100 par, and is distributed in lots of from one to three shares among the following subscribers: Charles Kirchhoff, Benjamin B. Lawrence, Arthur D. Little, Hennen Jennings, James Douglas, T. Coleman du Pont, Cleveland H. Dodge, Edward D. Adams, Frederick A. Goetze, Elon Huntington Hooker, Thomas C. Meadows, H. C. Perkins, Charles A. Stone, James J. Storrow, Elihu Thomson, Henry R. Towne, and Charles D. Walcott. The moneys paid in by these subscribers, it is believed, will pay expenses until the Corporation is more than self supporting. The Corporation will administer those patents given to it, and acquire others by purchase if it seems wise, and finances permit. If it prove what its founders hope, its surplus revenues will be given to the advancement of research in schools and societies. Apart from the good which a wisely administered society of this sort can do toward encouraging research, it is pointed out that often times a patent given to such a society, that could protect certain persons in its use, would be of more public benefit than to give the patent freely to the public, for what is every body's business is nobody's business, and without some limited protection no one uses the invention.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

A Difference in Views

In the JOURNAL of Sept. 28, 1912, on the first page, there is a prominent editorial in reference to the affairs of the American Institute of Mining Engineers.

In that article the suggestion of the Committee of Five that the honorarium of the retired secretary be discontinued as a measure of economy is characterized as "indecent." We decidedly object to having any action taken by us or a committee of which we are members characterized as "indecent."

The Committee of Five found that the institute, in order to meet its unavoidable financial obligations, would have to have more money; and the recommendation that salaries be cut in order to economize and to provide funds to meet aforesaid obligations was, therefore, made. We do not believe it indecent to recommend economies or to carry them out in order to live within one's means.

We ask that this communication be published in full.

GEORGE C. STONE
C. R. CORNING

New York, Oct. 7, 1912.

[This attitude is like that of an able-bodied man saying to his aged father: "Well, old fellow, if I don't earn any more money, I'll have to turn you out of the house." We characterized this as indecent, considering the word to fit the case. Webster gives these synonyms: Unbecoming, indecorous, indelicate, unseemly. They conform to our ideas about appreciation, loyalty and recognition in this case, which pertains to life-long, self-sacrificing services.—EDITOR.]

Illuminating the Cross Hairs

In the JOURNAL of Sept. 28, 1912, I notice, in "Details of Practical Mining" under the head of "Illuminating the Cross Hairs in Mine Surveying," the description of a method that, so far as I know, is in general use on the Mesabi range.

I find that tracing cloth held behind the plumb-bob string works well when the mine is dry, but if there is any water dripping, the cloth soon becomes soaked and useless.

To overcome this difficulty I save the heavy oiled paper that my blueprint paper comes wrapped in, and use this. I find that the water has little effect on it and that it lasts much longer than tracing cloth does under the circumstances, besides giving just as good results.

The method is especially good when an acetylene lamp is used behind the paper instead of a candle.

J. SMITH.

Hibbing, Minn., Oct. 1, 1912.

[A domestically minded contributor to *Coal Age* suggests that the surveyor ask his wife to get him an embroidery ring and insert the tracing cloth or paper in that. It is then tight as a drum head and a lamp behind it will give a good illumination to plumb-bob string and cross hairs. If the surveyor is unmarried, he can ask his best girl.—EDITOR.]

A Tempest in a Teapot

We wish to take exception to some of the statements in the editorial comment appended to our letter in the JOURNAL of Aug. 31. Our letter called attention to the impropriety of publishing Frank H. Probert's detailed description of what is essentially the Fairlie electrolytic cabinet 4½ years after it had been adequately described by us in another journal, without mentioning the designer's name.

In the first place, we deny that Mr. Probert's article is more useful than ours. Our article excels Mr. Probert's in many instances, whereas the only point on which Mr. Probert's article excels ours in utility consists in publishing the names of some dealers in the various parts of the apparatus described, information which belongs in the advertising columns, perhaps, but not in a technical or scientific description. In the second place, the following editorial statement does not apply to the point at issue: "Nor do we conceive any impropriety in failing always to attach the inventor's name to a description of a method that has become standard."

No originality was claimed by us for the use of the rotating anode in the electrolytic determination of copper. It was the apparatus, not the method, for which credit should have been given. The editorial comment continues: "For example, basic copper converting is frequently the subject of description and discussion without any reference to Messrs. Peirce and Smith."

We venture the opinion that no reputable journal would publish an article describing a basic converter which from drawings and photographs accompanying the article could readily be distinguished as a Peirce-Smith, without mentioning the names of the designers. It is an odd circumstance, which does not add force to the editor's argument, that in an article entitled "Progress of Basic Converting," in the very same issue of the JOURNAL (p. 408) the names Peirce-Smith appear four times within the space of an inch and a quarter. We have consulted the editors of two other important technical papers published in New York, and both are emphatically of the opinion that in the instance of which we complain an impropriety was committed, and that the ENGINEERING AND MINING JOURNAL committed a further impropriety in failing to acknowledge the earlier one.

Finally, we did not say that Mr. Probert is not an honorable engineer, but we do say that it was his duty to investigate the published literature on the subject of rotating anodes before attempting to add to it.

ANDREW M. FAIRLIE,
ALBERT J. BONE.

Copperhill, Tenn., Sept. 18, 1912.

[Mr. Probert described a method used in the laboratory of a company under his direction, not mentioning its fathers, not knowing them; and we published his article and commented approvingly of the method, also without mentioning its fathers, not knowing them. Mr. Probert and we are duly sorry that we offended them. However, our conscience does not convict us of any impropriety, the opinion of the "editors of two important technical papers," or two hundred, to the contrary notwithstanding. The attitude of our correspondents rather reminds us of a theater program, "costumes by Jenkins," "wigs by Blenkens," etc.—EDITOR.]

Acetylene Lamps

In the issue of the JOURNAL of Sept. 28, 1912, I notice that "Surveyor," of Calumet, Mich., strenuously objects to the use of acetylene lamps for underground surveying. I have also experienced similar difficulties to those he mentions in attempting to level up with the lamp in the hand, or to take sights with the lamp in the hat. I have found a simple remedy, however, which has proved effective. By buckling a small leather strap around the chest just under the arm-pits and over the vest, a convenient place is found upon which to hang a small lamp, where it will give ample light for leveling up, using notebook, and the general manipulations about a transit. It is readily attached and detached, and does not interfere with sighting. If the strap tends to slip down this is prevented by a couple of belt straps sewed to the vest.

W. A. FUNK.

Idaho Springs, Colo., Oct. 5, 1912.

Peculiarities in the Drift

By Josiah Bond*

A description of some ore deposits in which the valuable minerals occur in pay shoots in the vein. Some of these shoots are irregular and the indications are that they were formed later than the vein and by different agencies.

*Mining engineer, Alto, via Patagonia, Ariz.

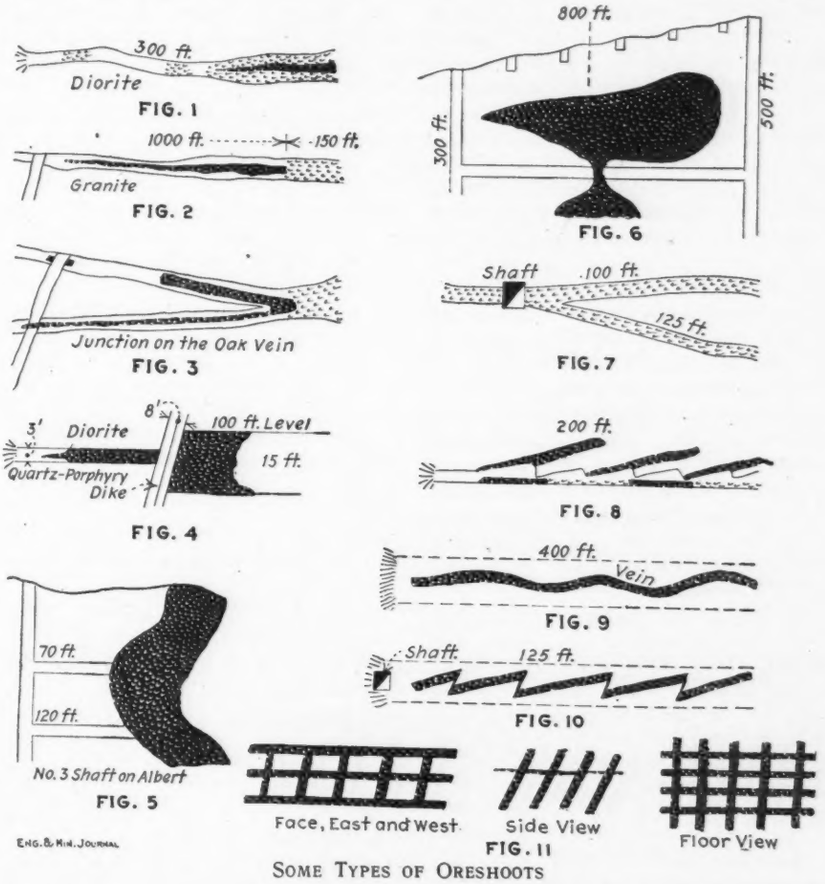
There seem to be as many varieties of ore occurrence as there are veins; indeed, the same vein may show diverse ore occurrences. This will happen frequently in the part of the vein that is in the zone of oxidation or secondary enrichment. Such parts of the vein show great irregularities, even though the unaltered vein is regular. This is the more striking if a distinction be made between the pay ore and that which is not so rich, as must be done in a mining venture. An old saying is, "Find your vein or lode and then find a pay streak; veins being many and pay streaks (that are found) being few." Sometimes when found the pay streak is a narrow, weakly thing and often quite short.

I used to hear discussions as to the possible length of a continuous pay streak, and from what the old miners said and from what I have seen, it has gradually become an opinion of mine that it is a lucky man who can uncover a pay streak as long as a mine claim or 1500 ft. There are a few such, but not many. The few there are if they carry ore of good grade, become bonanzas of the first order. One or two of the great bonanzas have had no such length of pay streak in the orebody. After the lode has been found it becomes necessary to find the pay streak, which is not easy to do. It would be simpler if the assumption were always made that every lode has its pay shoot, and if the discoverer always had enough money to work systematically until that pay shoot could be found.

Three Pay Shoots Close Together

The following examples of oreshoots may be of interest in that they show the variations in ore occurrences in what are, considered as a whole, regular lodes; the reason for the ore occurring in shoots being unknown. In searching for the ore, the walls are left undisturbed whenever possible, and in these must be sought the principal determinants of the situation of oreshoots. The discussion of this feature must be left to another time. Take the occurrence illustrated in Fig. 1, which is a plan of the lower tunnel of the Blaud. In this figure, as well as in the others, the checked portions indicate low-grade ore, probably under a commercial grade, while the shaded portions show good ore, the real pay streak. In driving this adit a mineralized area was entered at 50 ft., another at 140 ft., while the last one was met at 190 ft., from the portal. It is possible that all these belong to the same pay shoot, being the upper fringe; oxidation having gone to unequal depth along the top of the ore. The first ore streak was about 3 ft. wide, but the last widened out, as the adit was driven, until as it now stands it is about 12 ft. wide. Of this about 3 ft. is solid pay ore; the remainder is of undetermined value, but improving with every foot of drifting with the probability that, if not now, it will all soon be merchantable ore, in which case the deposit will be of great value. The ore contains copper and silver, the copper occurring as chalcopyrite. Chalcocite was found in the upper part of the vein and covelite near the surface. The country is diorite and the vein, as indicated by the quartz, was deposited in an open fissure. Work is now progressing on this oreshoot.

In Fig. 2 is shown the plan of the great oreshoot in the Alto as opened on the level of what is called the 300-ft. tunnel. The rock is coarse granite. The shoot of ore is nearly 1000 ft. long and widens from a point to more than 4 ft., and is ore of good quality without a break and continually widening and getting better until a decomposed section is reached. On the surface over this section was found a body of high-grade silver ore, and Kirby Thomas suggested that this is only a part of the vein where oxidation has proceeded to greater depth than elsewhere, and under this oxidized section might be found the greatest body of ore in the mine. He also raises a point in general that in the dry Southwest, it might not always be advisable to sink on that part of vein which shows the best ore or at least the largest bodies of oxidized ore, on the principle that the larger the body of surface ore, the greater the depth to which oxidization has gone, and the permanent ore might and usually would be reached at less depth on a part of the vein which was not so marked by surface enrichment. It is probable that work may soon be done near this very point, but lower down. A tunnel has also been started at a place 500 ft. lower, and when it reaches the payshoot the latter should be well delineated.



Some Types of Oreshoots

Shoots of Primary and of Secondary Ore on the Same Level

On the Oak claim is found a condition which is nearly the same as the two foregoing, but which is marked by a junction of two veins or two branches of the same vein. The plan is shown in Fig. 3. The rock is granite and the vein was reached by the crosscut which opened the narrow shoot first. Drifting on this finally showed the wider shoot. These two shoots come together making a fine body of ore, which on this level ends in oxidized low-grade ore. A peculiarity of this ore occurrence is that the narrow shoot is what might be called primary ore, the copper mineral being chalcopyrite, while in the other branch the copper mineral is tetrahedrite, generally supposed to be secondary. Both carry about the same percentage of copper, but the tetrahedrite also carries 80 oz. of silver. I cite Dr. C. P. Berkey to the effect that silver is an essential constituent of tetrahedrite (and tennantite, too, I suppose), an opinion that is confirmed by several hundred assays of the mineral for silver that have been made on these gray-copper deposits, as without exception silver was always found in significant amounts.

A Pay Shoot Crossing a Dike

The North Star vein lies in diorite and running down a hill offered a good site for tunnels. Fig. 4 shows the upper tunnel, which starts in on a 3-ft. vein, which is all pay shoot after the surface alteration is passed. About 40 ft. in, the vein is cut off by an 8-ft. dike of quartz-porphyry crossing nearly at right angles. Upon driving through this the pay shoot was again found, but instead of being 3 ft. wide as before, it was 15 ft. wide and a homogeneous ore. The ore consisted of quartz, copper and iron sulphide, which averaged 5% copper and carried 6 to 8 oz. of silver and a small amount of gold. While this ore from the heart of the Santa Ritas is not a very profitable shipping ore, it can undoubtedly be treated profitably on the ground, and if it holds its present width and copper tenor it will make a good mine.

Shoot with Reverse Pitch

In Fig. 5 is shown a section of the oreshoot and the work done on the Albert claim. This shoot, the length of which is not yet known, begins at the surface to pitch to the west and for that reason a shaft was sunk far enough to the west to intersect the shoot at about 200 ft., if the pitch continued regularly. The work, however, showed that at the 100-ft. level the shoot changed its pitch to the east, at about the same angle that it pitched above to the west. This was a good body of ore, generally netting $35 per ton, from copper, lead and silver when shipped. From the pay shoot about $40,000 has been returned. This mine was shut down for three years and the water that gathered in the workings became so impregnated that it contained about 16 lb. of copper per ton. When the shaft was unwatered a rude precipitation works was built and tin cans and old iron was used with the result that several tons of 40% cement copper was obtained. At this time the water was rich and, besides much iron and copper, carried so much free acid as considerably to hinder precipitation. The iron part of a shovel, that had been but little used, was entirely dissolved in this water in less than two days. It may be remarked that this was the driest time ever known at the mine and the solution was more concentrated than would ordinarily have been the case.

Shoot Missed in Two Shafts Found in Connecting Drift

In Fig. 6 is shown the Jenny Lind oreshoot. There were two claims staked on this vein, the dotted line showing the line between the two. They belonged to two owners. A stranger bought the lower claim and sunk the shaft 300 ft., finding nothing that he could utilize. Thinking well of the vein he bought the upper claim and sunk the shaft on it 500 ft., again finding nothing. He then drifted between the two running both ways, and just as the two were joined he cut a little neck of good ore. When further developed the orebody was as shown. If his first shaft had been 20 ft. further up the hill he would have cut the pay shoot; if the second shaft had been 25 or 30 ft. further down hill it would have been in ore a good part of the way. It is not known as yet how the shoot flares below this drift, but it would be in keeping for the neck to be narrow and short. The persistence on the part of the miner achieved results in this case.

In Fig. 7 is shown the lower or 200-ft. level on the Star claim, which is a ramifying vein in trachyte. The two branches and the main stem are equal in width, each being about 3 ft. wide, and on this level they carry copper-sulphide ore containing about 3½% copper and several ounces of silver. Unlike the vein shown in Fig. 3, where the two branches are of different kinds of ore, in this case the branches carry the same kind of ore, which argues for simultaneous deposition, while in the other case there were different periods of deposition or a complete alteration of one of the veins.

In Fig. 8 is represented a replacement lode. The rock here is brecciated dacite. This occurrence is on the lower Jersey Girl claim. The ore is good, containing about 10% copper, 30% lead, and is rich in silver. The main vein is from 1½ to 4 ft. wide, and two shoots of pay ore are known. The branching shoots are, as a rule, narrow, as far as they have been followed, but the grade of ore is better. How far these pay shoots run off is unknown, but it is thought that they pinch out shortly, the greater part of the ore being in the main vein. In the vein under discussion a common feature of replacement veins is well illustrated; it is that the replacement has planed down one wall while the structure of the other has not been disturbed. In cases of this kind that have come under my observation the pay shoot is found against the smooth wall, and if there are many branchings they run out into the other wall.

A Tortuous Pay Shoot in a Straight Vein

The next two figures represent pay shoots, the course of which is not the same as the vein. Fig. 9 shows a tortuous shoot about 2 ft. wide in the 8-ft. vein, as shown in the lower tunnel of the Fortuna group. This is in trachyte, and it is thought that the vein was a deposition in a fissure. The pay shoot was a later enrichment by replacement. This shoot carries base ore, valuable for its copper, silver and gold. Outside of the pay shoot the whole vein carries quartz with a little copper, but not enough to make pay ore. In an upper tunnel, however, this quartz vein carries copper, so that possibly greater depth might show ore. If this is so the pay shoot on this level may be merely a redeposition of part of the original contents of the whole vein. A still lower tunnel may be driven on this vein and when this is done the whole process may become clear.

In Fig. 10 is shown a peculiar ore occurrence in drift No. 2, of the Eureka. The rock is andesite porphyry. The vein is regular, running straight across several claims. The pay shoot appears as if it were faulted, but aside from this, is regular. The pay shoot is secondary, however, the ore being gray copper with silver running up to 500 oz. Just what happened here is obscure to me. I have thought that the shoot may be merely a zig-zag, with the cross members nearly obliterated, this being a relic of the original joint structure of surrounding rock, but the vein may have been faulted, as at first sight appears. Deeper work on this vein may elucidate this problem, which is out of the ordinary.

A Peculiar Stockwork

In Fig. 11, three views of a stockwork on Ash Creek are shown. These views are taken in a cut running from south to north in the deposit. The rock is andesite. The size of the deposit is not known or its richness, but it looks good enough to be of commercial value. The north and south stringers dip to the west, while the east and west stringers dip to the north. It is rather curious that the dip of the latter represents the average dip of the veins of the neighborhood, while the dip of the former is of about the same as the dip of the oreshoots. The ore in many of these stringers which cut up the rock into oblong pieces about

9x12x18 in., and are themselves from ½ to 2 in. wide, is heavy sulphide. It will take much work to demonstrate the value of this deposit, which is not likely to be done while so many more simple chances are open.

Angels Camp, California

By Lewis H. Eddy

The mining situation in Angels Camp district, Calaveras County, Calif., despite apparently unfavorable conditions, presents evidence that systematic development may put the large mines again on a paying basis and encourage the reopening of old mines that have been idle for lack of capital and modern methods of mining and treatment.

Mill Capacity Exceeds Ore Supply

The crushing capacity of the mills in the district approximates a total of 1200 tons per day, including five large mills and two or three smaller plants. Of the 240 stamps forming the total equipment of the large mills, only 80 stamps are now dropping, and the 20 or 30 other stamps are also idle. In the first quarter of the present year there were 220 stamps dropping in the camp. In the first part of the second quarter the 60 stamps of the Lightner were closed down, and shortly after that the 40 stamps of the Dolling also stopped dropping. Both mills had practically exhausted the ore supply and the necessity for exploration of the lower ground for new orebodies being recognized, development was pushed vigorously with encouraging results in both cases.

The history of mining in Angels Camp shows that large orebodies carrying high-grade ore have been generally confined to shallow depths. At a depth of about 300 to 400 ft. a body of talc, approximately 100 ft. thick, intrudes into the schist hanging wall, cuts across the quartz and enters the foot wall, at an angle of 50 to 55° easterly. A small quantity of pay rock has been found in portions of this talc, and in some instances it has been milled with the quartz. Experience has proved that greater economy results from ignoring the small gold content in the talc and continuing the exploration at greater depth. At the time of closing down the Lightner mill, the vertical shaft was down 700 ft. and into the talc. The shaft has since been deepened to 1000 ft. Having passed through the talc, a drift was driven west 150 ft. to the foot wall at the 900-ft. point. In this drift ore of an encouraging character was encountered. The shaft will be further deepened to the 1200-ft. point, when another drift will be driven.

The Dolling mine, which was formerly known as the North Star, is situated about three-quarters of a mile south of the Lightner. The Dolling is a new mine, having been in operation about a year when the mill was closed, pending the development of new orebodies. The depth of the inclined shaft is 400 ft. Ore was extracted from four levels, keeping 30 stamps dropping until last January, when 10 more stamps were added. The property is owned and operated by the Dolling Gold Mining Co., D. G. Overall, superintendent. It is expected that the mill will be again placed in commission the latter part of this year. The sinking of a new vertical working shaft is contemplated.

Utica Company Is Principal Producer

The Utica company, a close corporation, occupies an interesting and peculiar position in the district. It is not only the most important mining operator and producer in Angels Camp, but in addition operates electric-light and power and water plants, furnishing power and water to some of the mines and light and power to the town of Angels Camp. The company has kept 100 stamps dropping during the present year in spite of the mishaps that have occurred at the Gold Cliff and the continued exploration for new orebodies in the Cross shaft of the Utica mine.

The 40 stamps of the Gold Cliff were closed down at the end of August from ore shortage, because many muckers became frightened and refused to work after the surface caved into an abandoned portion of the mine, on Aug. 18. The closing down of the mill should be only temporary, as the working shaft was not damaged and no active part of the mine was interfered with. The Gold Cliff produced about 200 tons per day, but the mill has been required to keep pace with the extraction in order to meet the demands for exploration and development and to aid the exploration and development of the Utica.

The 800-ft. working shaft is connected with a winze at a point 150 ft. northwest and the 1000- and 1100-ft. (winze) levels are connected with the shaft by raises; the 1600- and 1700-ft. (winze) levels are in good ore and when extended northerly toward the Utica, are expected to tap the orebodies in the extensions south from the Cross shaft. The purpose is to connect these two mines at a depth that will develop pay orebodies, and thus extend the life of the mines. The mines are about three-quarters of a mile apart, the Utica mine and the Stickles mill being situated at the town of Angels Camp, the Gold Cliff mine and mill to the southwest of the town. Added to other costs the company was recently obliged to order a new electric hoist motor to replace the one destroyed in June by caving of overburden. There was the further loss by the destruction of the entire hoisting-engine plant, but the expense of new machinery is obviated by the use of a plant formerly operated by water on an adjoining property, which will be electrically driven when equipped with a 225-hp. Westinghouse motor.

The Angels mine is still extracting ore and the mill is dropping 20 of the 40 stamps, as it has been doing in the present year. Allan Randall has succeeded Thomas Fullen as superintendent. The operating and development plans of the mine and mill have not been made public, but it is understood that the mine will be further explored with the purpose of developing new orebodies and the operating of the mill to full capacity.

August Operations at Goldfield Consolidated

During August, 1912, the total production of the Goldfield Consolidated Mines Co., according to the official report of the general superintendent, J. F. Thorn, was 32,538 tons, containing $465,289, or an average of $14.30 per ton, of which 30,330 tons was milled with an average extraction of 89.31%, and 2208 tons was shipped of an average value of $15.26 per ton, the net recovery from all ore being $12.88 per ton. The total net realization to the company was $223,581, or $6.87 per ton. The total cost of mining, development, transportation, milling, office and general expense, was $6.14 per ton, distributed as shown in the accompanying table.

GOLDFIELD CONSOLIDATED OPERATING COSTS FOR AUGUST, 1912

Mining, including stoping and development	$3.30
Transportation	0.11
Milling	1.86
Marketing	0.05
General expense	0.28
Bullion tax	0.03
Marketing ore shipped	0.53
Total cost of operation	$6.16
Miscellaneous earnings	0.02
Net cost per ton	$6.14

From the Combination, 136 3X, the new stope from the second level, 200 ft. northeast of the shaft, 577 tons of $23 ore was produced. At the Jumbo No. 2 the 217 drift on the 200-ft. level going south, encountered a small vein which produced 50 tons of $74 ore. Not enough work has been done to determine the extent of this vein in length or depth.

At the Mohawk the stopes being carried through the old Sheets-Ish and Begole lease workings produced 1801 tons of ore averaging $19 per ton. The stope in the old Hayes-Monette lease workings above the 250-ft. level produced 454 tons of ore averaging $24 per ton. The 202 stope being carried through the old Francis-Mohawk workings produced 531 tons of ore averaging $20 per ton. The 348 stope being worked through the Loftus-Davis lease workings above the 450-ft. level produced 291 tons of $72 ore. The 490-I

stope which was cut out of the 438X drift between the 600- and 450-ft. levels produced 1856 tons of ore averaging $84 per ton.

At the Clermont the 571 drift on the downward extension of the 510 orebody between the 900-ft. and 750-ft. levels produced 100 tons of ore averaging $40 per ton. On the 1300-ft. level of the Grizzly Bear a sill is being cut in the 802 orebody and has produced 140 tons of average $22 ore, which was shipped to the smelter. The Grizzly Bear shaft has been completed to the 1400-ft. level and a sump cut: the drift on this level was advanced 30 ft. from the shaft.

Oriental Consolidated

The report of the Oriental Consolidated Mining Co. for the year ended June 30, 1912, shows that its mines in Chosen, Asia, produced 323,703 tons of ore having a gross value of $5.86 per ton. This tonnage was less than the previous year, due to shortage of labor and cordwood at the Candlestick and Kuk San Dong mines. The yield in the form of bullion and concentrate was 89.9% of the above amount. While the total gross receipts were the largest in the history of the concession, the net profit of $652,527 was $20,193 less than the previous year. The total cost per ton of $2.83 was 20c. higher than last year. This was mainly due to larger construction and development expenses, a decrease of 2% in the free-milling percentage of the ore, increased government tax on fuel and the extraordinary expense ($10,917) of fighting the flood at Charabowie mine.

The development work during the year amounted to 23,037 ft. and gave satisfactory results in all but the Kuk San Dong mine. The estimated ore reserves, July 1, 1912, were 741,000 tons containing $3,840,000. At the Taracol mine the orebody dips away from the working shaft. To avoid driving long drifts, further sinking of the main shaft will be abandoned and instead a winze will be sunk from No. 7 level in the orebody to develop the lower levels. For the same reason no further sinking on the main Chintui shaft or on the winze in block 16 will be done; but sinking will be continued on the No. 3 level winze in block 2. On Feb. 18, 1912, cracks in the roof of old stopes in the Charabowie mine opened, allowing water from the river to rush in. By the use of extra pumps, etc., the flooding of the mine was prevented.

The average actual running time of the 240 stamps in five mills was 313.5 days, the stamp duty being 4.5 tons per day. The Taracol tube-mill plant, designed by A. E. Drucker, metallurgist of the company, to take the place of the old Taracol leaching plant, was completed in May, 1912, at a cost of $65,000. This sum includes the cost of complete power installation for both the tube-mill plant and the dump-retreatment plant. The treatment consists of classifying, all-sliming, continuous Pachuca agitation, Merrill zinc-dust precipitation supplemented by zinc boxes, and filter pressing. One strong cyanide solution is used for grinding and total treatment. The plant consists of one 5x18-ft. tube mill, two 3-in. Morris sand pumps, two vertical triplex pumps, four 10x40-ft. Pachuca agitators connected for continuous agitation, four cone classifiers, six Callow cone thickeners, two 6x25-ft. settling tanks, two 6x25-ft. sand filters, one Merrill zinc-dust press, five zinc boxes, one Monteju receiver, one 50-frame Dehne filter press, two Morris solution pumps, two vertical triplex pumps, one 10x30-ft. solution sump, one 10x15-ft. gold sump, two stock-solution tanks and set of lead electrodes for the electrolysis of sump solution. The results for July are as follows: Tons of concentrate treated, 2070; value, $29.20 per ton; extraction, 88.2%. It is believed that the results will improve as the plant becomes adjusted.

Cyaniding of Concentrate

The results of experiments, made by Robert Linton to determine whether it would be advisable to cyanide certain concentrates rather than ship them to a custom smelter, are given in the *Journ.* Chem. Met. and Min. Soc. So. Africa, July, 1912. The analysis of the concentrate was as follows: Insoluble, 44%; Fe, 26.50; Cu, 1.30; Zn, 1.20; MnO_2, 0.41; Al_2O_3, 1.40; CaO, 1.75; MgO, 0.47; As, 0.03; S, 18.20; Ag, 4.29; Au, 0.06; total, 99.61%. The silver occurred as sulphide, chiefly or perhaps wholly, in the form of argentite. The gold was carried in the silver sulphides.

Agitation in water indicated that the concentrate was neutral, but when agitated with N/10 acid and titrated with N/10 NaOH it showed alkalinity of 0.44%. The concentrate was ground to pass 200 mesh and the treatment carried on in a model Pachuca tank, 10 in. diameter by 30 in. deep, with a 1½-in. pipe for air lift and a ¼-in. pipe for air feed.

The first tests showed a constantly increasing alkalinity in the solutions used, although no lime was added to the charge after commencing agitation. An analysis of the solution after agitating five hours gave the following results: Total cyanide, 0.097%; free cyanide, 0.092; protective alkali, 0.1433; alkaline hydrates, 0.0762; hydrocyanic acid, 0.0033; ferrocyanides, 0.0289; sulphocyanides, 0.0358; alkaline carbonates, 0.1407; zinc, 0.0040; copper, 0.0688. There was no reaction for alkaline sulphides, although K_2S probably formed and immediately combined with more potassium cyanide to form potassium thiocyanate, KCNS. This would seem to explain the increase in alkalinity observed—and to indicate that this increase in alkalinity involves a direct loss in cyanide. The reactions would be as follows:

(1) $FeS + 6KCN = K_4Fe(CN)_6 + K_2S$.
(2) $K_2S + KCN + H_2O + O = KCNS + 2KOH$.

Several bottle tests were made to determine whether or not lead acetate would react with the K_2S and prevent the excessive consumption of cyanide. With less than 1% lead acetate, it appears to have little if any effect; with 1% or over the increase in alkalinity above noted gradually disappeared, but at the same time the consumption of cyanide greatly increased. The results of five tests of agitating 10 grams of concentrate with 50 c.c. of solution titrating 0.73% KCN for 72 hr. are given in

TABLE I. EFFECT OF LEAD ACETATE IN CYANIDING CONCENTRATE

Test No.	Lead Acetate added. %	Per cent. KCN after 72 hr. agitation	P.A. after 72 hr. agitation
1	None	0.22	0.056
2	1	0.21	0.036
3	2	0.205	0.025
4	4	0.185	0.002
5	8	0.047	0.000

Table I. The extraction of gold and silver in each case was practically the same.

From a study of the preliminary tests an outline of treatment was formulated and a test run of 76 hr. was made in the small Pachuca agitator. Details of this run are given in Table II.

TABLE II. DETAILS OF CYANIDE TEST ON CONCENTRATE

Hours agitating	Cyanide added per ton concentrate lb.	Lime added per ton concentrate lb.	Solution		% Extraction	
			%KCN	P.A.	Au.	Ag.
2	....	109	..	..	..	..
4	62.6	....	..	..	..	..
7	....	....	0.58	0.31	17.4	20.8
13	....	....	0.18	0.35	54.9	40.5
19	....	....	0.12	0.35	79.2	52.6
22	62.6	62.6	..	..	..	..
25	....	....	1.30	0.36	..	..
31	....	....	0.91	0.44	79.2	63.2
37	....	....	0.75	0.47	..	..
43	....	....	0.59	0.48	..	..
45	....	....	0.56	0.48	82.6	74.6
46	62.6	93.9	Fresh Solution			
48	....	....	1.17	0.30	82.6	80.8
54	....	....	1.08	0.35	87.3	82.2
57	....	....	0.98	0.35	87.3	85.2
60	....	....	0.92	0.39	88.5	87.8
62	....	....	0.88	0.39	90.2	87.9
64	....	....	0.87	0.39	..	..
66	....	....	0.85	0.39	..	..
68	....	....	0.82	0.40	90.2	89.1
70	....	....	0.78	0.40	90.2	90.5
72	....	....	0.78	0.40	91.1	90.6
74	....	....	0.77	0.40	91.8	92.5
76	....	....	0.77	0.40	92.1	92.7

Another test was run, using less cyanide in solution, but higher protective alkalinity, and lead acetate equivalent to 3.5% of the weight of the concentrate treated, also raising the ratio of solution to concentrate to 3:1 (previous tests having been at 2.5:1). The results of this test are shown in Table III.

The results of all the tests run seemed to indicate that the most economical treatment was to grind the concentrate in a solution of about 0.2% KCN, then agitate in a 0.6% KCN solution, raising to about 0.8% toward the end of the treatment. Maintaining a high protective alkali proved to be of little benefit, about 0 10 to 0.15 being sufficient. The use of lead acetate appeared to be of no benefit in preventing destruction of cyanide, although the use of a small amount serves to keep the solutions clear.

TABLE III. DETAILS OF FINAL CYANIDE TEST

Hours agitating	Cyanide added per ton concentrate lb.	Lime added per ton concentrate lb.	Solution		% Extraction	
			%KCN	P.A.	Au.	Ag.
2	....	74	....	....	..	..
3	23	....	0.15	0.39	..	..
4	26	....	....	....	..	..
6	....	....	0.37	0.44	..	..
7	16.4	....	....	....	..	..
8	....	....	0.27	0.55	45.0	36.8
14	....	....	0.09	0.57	46.8	49.0
20	....	....	0.06	0.58	54.0	68.3
22	32.8	....	....	....	..	..
26	....	....	0.45	0.66	55.2	68.4
32	....	....	0.19	0.69	56.4	68.3
38	....	....	0.17	0.70	58.1	69.2
44	....	....	0.15	0.71	61.0	70.9
46	....	....	0.15	0.72	63.3	71.4
47	49.2	93.8	FreshS	olution		
50	....	....	1.0	0.39	63.8	73.5
54	....	....	0.88	0.41	65.0	76.7
58	....	....	0.78	0.45	67.4	77.2
62	....	....	0.70	0.47	75.0	88.8
64	....	....	0.67	0.48	75.0	90.6
66	....	....	0.67	0.48	76.4	91.6
68	....	....	0.65	0.49	80.0	91.7
70	....	....	0.63	0.50	82.0	91.8
72	....	....	0.62	0.50	82.0	92.2
74	....	....	0.61	0.50	84.0	92.2
76	....	....	0.57	0.50	85.0	92.5
78	....	....	0.57	0.50	88.0	92.6

The World's Nitrate Supply

That the current statements regarding the exhaustion of the world's supply of fixed nitrogen are uncalled for, is asserted by William S. Myers, official delegate of the Chilean government to the International Congress of Applied Chemistry, and head of the Nitrate Propoganda in this country. In a letter to the New York *Times*, he says that the exhaustion of the Chilean nitrate supplies is by no means imminent:

First of all, there is a vast amount of unsurveyed nitrate ground on the Chilean pampas that is known to contain immense quantities of nitrate of soda. Second, grounds already surveyed still contain enormous quantities of nitrate. There are probably in round numbers, 1,000,000,000 tons of nitrate in the deposits of Chile, and, without doubt, large supplies also exist on lands now but incompletely prospected. The surveyed and certified tonnage opened up at the present time ready for extracting is fully 250,000,000 tons.

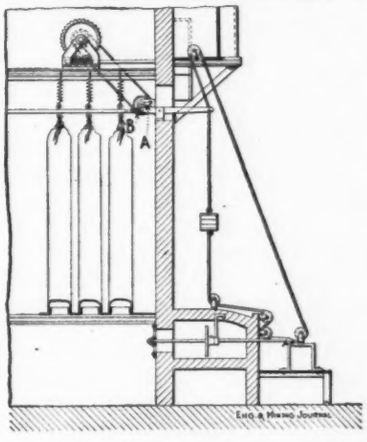
The probable life of the surveyed deposits is at least 400 years, even allowing for a steadily increasing annual rate of consumption. Moreover, there remains the interesting question as to whether by the end of the ensuing century we may not find that nature has manufactured an immense additional amount of Chilean nitrate for the uses of the world.

Sir William Crookes' prophecy that the world would starve as soon as the Chilean nitrate supplies were exhausted has for some years led the chemical public to believe that a wheat famine was in sight, but that time is so far distant that no one living today need have misgivings on the subject.

Meier's Bag Shaking Device

A bag-shaking device has recently been patented by A. J. Meier, of Glendale, Mo., U. S. Pat. No. 1,030,477. As shown by the illustration, the bags are suspended by springs at the top, allowing both a lateral and vertical motion. The arrangement of the baghouse is the customary one, i.e., a number of independent compartments, each compartment containing its quota of bags opening into a cellar for the dislodged dust.

There is a cam-driven device which shuts a damper cutting off the flow of gas into the bags about to be shaken. This allows the pressure inside and out to be equalized, so that the dust will drop when the bag is shaken. Another cam, *A*, pushes the rod connecting the tops of a row of bags to one side, and when this releases the roller, *B*, the rod is drawn back by the springs, imparting both a lateral and vertical shaking motion.



MEIER'S BAG SHAKER

By means of a cam for each row of bags, all the bags in a section are shaken at the same time, after which the cam holding the damper-closing apparatus lets go, and the section resumes its normal working.

Foreign Coal Trade of the United States

Imports of coal and coke into the United States for the seven months ended July 31, were, in long tons:

	1911	1912	Changes
Anthracite	.....	30	I. 30
Bituminous	755,301	869,403	I. 114,102
Coke	49,225	47,790	D. 1,435
Total	804,526	917,223	I. 112,697

Canada furnishes a large part of the coal and nearly all the coke. Imports are chiefly on the Pacific Coast and for Northwestern states.

Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, seven months ended July 31, long tons:

	1911	1912	Changes
Anthracite	1,986,421	1,645,892	D. 340,529
Bituminous	7,039,969	8,077,177	I. 1,037,208
Coke	574,481	479,434	D. 95,047
Bunker coal	3,296,619	4,319,514	I. 1,022,895
Total	12,897,490	14,522,017	I. 1,624,527

The bunker or steamship coal is practically all bituminous. Canada takes about 70% of the exports; other large shipments are to the West Indies, Mexico and Panama.

Condition of Kentucky Fluorspar Mining*

The further development of old properties in Kentucky has given assurance of the recurrence of fluorspar shoots, both at depth and laterally, sufficient to verify previous predictions as to the possibility of large production from this district. That the output continues small in spite of good demand is attributed by F. Julius Fohs, of Lexington, Ky., to insufficient capital and improper management in the development of fluorspar prospects. It is contended that the systematic development of a limited number of properties would yield an attractive profit.

The working of deposits containing fluorspar and small quantities of zinc and lead has proved unprofitable in some instances because of failure to recognize the fact that the fluorspar is the most valuable mineral and the others merely helpful byproducts.

Fluorspar companies have sought to hide the presence of zinc at their mines, but since the separation of fluorspar and zinc is no longer difficult, the zinc may become a valuable byproduct.

The purchase of leases upon the advice of unscrupulous promoters, the installation of mine and mill equipment before sufficient development work has been done or without competent engineering advice, and the improper handling of vein and surface waters are given as some of the causes for losses in fluorspar mining.

It is suggested that the serious difficulties caused by lack of skilled miners may be overcome by proper instruction of the miners, instituting a bonus system and raising the standard of living. Under present working methods in Kentucky, it takes an average of 2.5 men, working 10 hr., to produce one ton of fluorspar ready for shipment. By proper management it is probable that this could be reduced to 1.5 men, inclusive of development work.

The consumption of fluorspar in America is estimated at about 110,000 tons annually, of which England supplies at least 25% from the tailings of lead

*Abstract of a portion of the report of the State Mine Inspector of Kentucky for 1910.

mines. In spite of the import duty of $3 per ton levied since 1909, the foreign product is still able to compete at points near the Atlantic seaboard. It is suggested that 10 properly developed mines could supply the present American requirements. Failure to recognize this fact and to extend present and create new markets may lead to economic loss.

Granby Consolidated

At a meeting of the directors of the Granby Consolidated Mining, Smelting & Power Co., William H. Nichols was elected president, succeeding George Martin Luther, who retires because of ill health. Arthur C. James and A. L. White retire as directors, the number of directors being reduced from 15 to 13. Deducting depreciation on works and securities for the year ended June 30, 1912, there was a shrinkage of surplus for the year of $17,183; the working expenses of mines and smeltery, freight, refining, and selling, amounted to $2,128,211; foreign ore purchased to $163,170; while metal sales brought in $2,874,760; leaving an operating profit of $583,379. However, a deduction of $600,562 was made for depreciation on works and securities.

At Phœnix and Grand Forks, the mines and smeltery were down for four months because of lack of coke. No new orebodies were discovered at Phœnix, but the known bodies were further developed, and the company closes the year with a total of 6,433,418 tons of ore in sight, which may be expected to carry about 1.25% of copper, 0.29 oz. of silver, and 0.043 oz. of gold per ton.

At Hidden Creek, development has gone steadily ahead, and over $200,000 has been expended in work preliminary to the construction of a smeltery. Prospecting has been carried on in the country surrounding Grand Forks and Phœnix for a radius of 200 miles, but the apparently meritorious claims are too inaccessible.

There were 13,231,121 lb. of copper produced, 225,305 oz. of silver, and 33,932 oz. of gold, from 721,719 dry tons of Granby ore and 17,800 tons of outside ore smelted. The mining cost, including development, was $0.771 per ton. The cost per ton, allowing for all expenses except depreciation, was $2.90, the cost per pound of copper was $0.111.

New Hill Building

Preparation is being made for the erection of a high building at the northwest corner of Tenth avenue and Thirty-sixth street for the Hill Publishing Co. George Milne has sold for James Bailey, representing the Tietjen and Fanning estates, to this company, John A. Hill, president, 469, 471, 473 and 475 Tenth avenue and 503, 505, 507 and 509 West Thirty-sixth street, forming the northwest corner, a plot comprising half the block on Tenth avenue by 175 ft. in Thirty-sixth street, including 17,500 sq.ft., and at present covered with tenement houses. During the last few years this section of Tenth avenue has attracted many large concerns.

The Hill Publishing Co. will erect a 14 or 16 story building of heavy construction, with the object of having the most complete publishing and commercial building in the city. Every known convenience for cleanliness, comfort, safety, low insurance and economical conduct of business will be installed. The publishing company will occupy several floors. A special feature of the building will be a roof garden for recreation for the use of the occupants of the building, both tenants and employees. The building will be ready for occupancy February, 1914.

Dos Estrellas Report for 1911

During the year 1911 the Compañia Minera Las Dos Estrellas, operating mining property in the Tlalpujahua district in the State of Michoacan and in the El Oro district, in the State of Mexico, Mexico, produced gold and silver worth 11,245,455 pesos; other receipts amounted to 2680 pesos, making the total gross income 11,348,135 pesos. The total expense of operation was 5,465,361 pesos, leaving a profit of 5,882,774 pesos. During the year four quarterly dividends, each of five pesos per share, were paid, making a grand total of 6,000,000 pesos paid to shareholders; 267,256 pesos was taken from the reserve fund to cover all disbursements. During the year a total of 223,344 pesos was spent to pay the cost of new installations, including three additional boilers to the steam-turbine plant, which is now prepared to furnish power to supplement that provided by the Mexican Light & Power Co. The surplus as of Dec. 31, 1911, amounted to 3,330,144 pesos. The total expense of installations, as of Dec. 31, 1911, amounted to $6,820,330, and this total amount of capital expenditure has been repaid and now stands in the accounts *pro memoria*.

A new contract was made with the American Smelting & Refining Co. covering the period from Jan. 1 to Dec. 31, 1912, by which better terms than formerly existed were granted to the company, so that it now gains 2½ pesos more per ton from smelting ore than formerly was the case. The sum of 3500 pesos was spent to purchase a small tract of land in Tlalpujahua from which limestone for use in the mills could be obtained.

During the year, 475,548 tons of ore was crushed in the two mills, one of 130 stamps, and the other of 120 stamps. The ore reserve, as estimated by General Manager Aldasoro, was 1,870,637 tons of ore of better grade, besides approximately 3,000,000 tons of low-grade ore.

Considerable work has been done to exploit the veins at greater depth, and so far this work has resulted in ascertaining that the veins persist for some distance as strongly as in the upper levels. This ore, while of lower grade, will produce a satisfactory profit.

American Institute of Mining Engineers

The adjourned meeting of the members of the American Institute of Mining Engineers was held on Oct. 7, in the United Engineering Building, with Professor Kemp, president of the institute, in the chair. About 50 members were in attendance. After the reading of the minutes of the previous meeting, which were approved, J. W. Richards, in behalf of the constitutional committee of the institute, with C. R. Corning seconding, made a motion to withdraw the pending amendments, which motion was unanimously carried.

C. R. Corning then introduced a long series of amendments to the constitution, drafted by himself and George C. Stone. J. W. Richards, as chairman of the constitutional committee, introduced two amendments. It was voted that all of these amendments should be printed so as to be available for discussion at the Cleveland meeting.

C. R. Corning then presented a series of amendments to the by-laws. Doctor Ledoux proposed to refer these to the board of directors, who have the right to make amendments to the by-laws, but Mr. Corning desired to have them printed for the information and discussion of the members. After considerable discussion, Mr. Corning's desire prevailed by a vote of 20 to 19.

Philip N. Moore moved that the sense of the meeting be expressed in favor of the abolition of the existing system of dual government of the institute and the concentration of authority in one body; and that the constitutional committee be requested to draft amendments to the constitution to carry out this idea. This motion was unanimously carried.

The Committee of Five was discharged with the thanks of the institute, after complimentary remarks about its work. The meeting was then adjourned to reconvene in New York, on Nov. 12.

Serpek Process in Norway

The exploitation of the Serpek patents in Norway is to be undertaken in Norway by Det Norske Nitriaktieselskab, of Christiana, with a capital of $2,700,000, already subscribed, says Vice-Consul General Haakon E. Dahr. Construction will commence immediately at Arendal, with the idea of using 10,000 hp. at first, and later 25,000. The annual output, commencing in 1914, is calculated at 40,000 tons of ammonium sulphate.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Determination of the Strike and Dip of Strata

BY E. R. RICE*

In ordinary mine and geological work, it is often necessary to determine the strike and dip of veins, faults or strata. It is seldom that the strike and dip can be measured directly, and when so done, the results obtained are liable to error owing to local irregularities in the vein and also to the necessity of having to use a short measuring base. When direct measurements are imposible, the rectangular coördinates of the three points in the vein must be found, and from these,

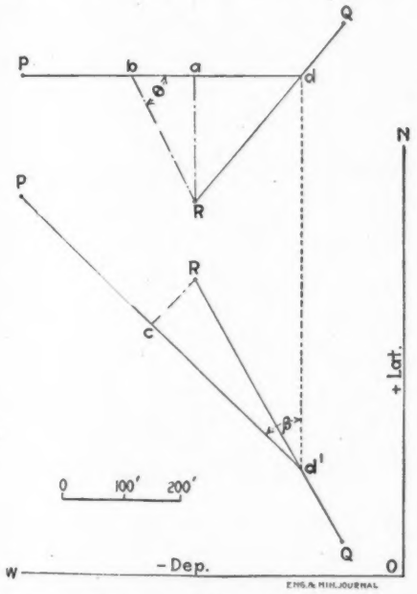


FIG. 1. GRAPHICAL METHOD FOR DETERMINATION OF STRIKE AND DIP

the strike and dip computed. It is to be noted that these three points must not lie in the same straight line. Herewith is given a graphical and an analytical method for the solution of this problem, the example being taken from actual practice. The graphical method is shown in Fig. 1, the points are *P*, *Q* and *R* and are shown in both plan and front elevation, the coördinates with respect to *O*, being as follows:

Point	Latitude	Departure	Elevation
P	+488.3	—483.1	3627.0
Q	+ 42.0	— 99.2	3688.3
R	+374.5	—266.3	3472.5

After the points are plotted in plan and elevation as shown, to get the strike and dip, proceed as follows: On the elevation, through either of the three points, as *P*, draw the horizontal line *P*—*d* until it intersects the line *Q*—*R* (or *Q*—*R* produced). The line *P*—*d* is a line of strike shown in front elevation. Then on the plan, draw the line *Q*—*R* and project *d* to *d'*. Then draw the line *d'*—*P* and the angle β will be the bearing angle of the strike. On the front elevation, draw the line *R*—*a* perpendicular to the line *P*—*d*, and on the plan, draw the line *R*—*c* perpendicular to the line *P*—*d'*. Lay off *a*—*b* equal to *R*—*c* and draw the line *R*—*b* and the angle θ will be the angle of dip of the vein. The angles β and θ are measured with a protractor, and in this case the strike is approximately N43° 45'W and the dip is 63° 15'.

The analytical solution is shown in Fig. 2, the example being the same. Let the coördinates of the point *Q*, be *X'*, *Y'* and *Z'*, and those of the point *P* be *X"*, *Y"* and *Z"* with respect to the point *R* which is the lowest of the three points.

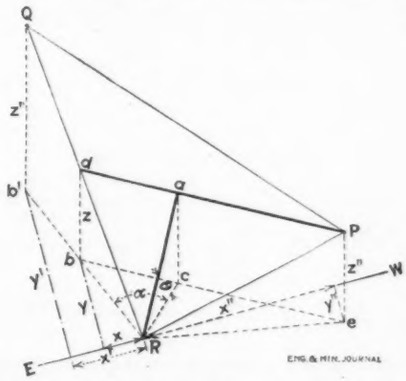


FIG. 2. ANALYTICAL METHOD FOR DETERMINATION OF STRIKE AND DIP

These coördinates are the differences between the total latitudes, departures and elevations of the point *R* and the other two points. The points *b'*, *b* and *e*, lie in the same horizontal plane as *R*. Also *P*—*d* is a horizontal line lying in the plane *PQR* and therefore is a line of strike and *Z* is equal to *Z"*.

From similar triangles, $Z' : Z = (b'R) : (bR)$ and $Y' : Y = X' : X = (b'R) : (bR)$.

Therefore $Z' : Z = Y' : Y = X' : X$ and

$$Y = \frac{Y'Z}{Z'} \text{ and } X = \frac{X'Z}{Z'}.$$

The tangent of the bearing angle of $dP = \frac{X'' - X}{Y'' - Y}$.

Let the azimuth of the line *dP* be represented by ρ, then the azimuth of *Rc* $= \rho - 90°$ (*Rc* and *aR* are in the same vertical plane and *aR* is a line of dip and is at right angles to the strike.)

Tangent of the bearing angle of $Rb = \frac{X}{Y}$. Let the azimuth of *Rb* be denoted by ρ'.

Then $\alpha = \rho - \rho' - 90°$.

$$bR = \sqrt{X^2 + Y^2}$$

$$Rc = bR \cdot \cos \alpha = \cos \alpha \sqrt{X^2 + Y^2}$$

$$Tan\ \theta = \frac{ac}{Rc} = \frac{Z''}{\cos \alpha \sqrt{X^2 + Y^2}}$$

The values of these coördinates are as follows, *X'*, +167.1; *X"*, —216.8; *Y'*, —332.5; *Y"*, +113.8; *Z'*, 215.8; *Z"*, 154.5.

$X = (+167.1)\left(\frac{154.5}{215.8}\right) = +119.6$ and $Y = (-332.5)\left(\frac{154.5}{215.8}\right) = -238.1$.

$\frac{X'' - X}{Y'' - Y} = \frac{-336.4}{+351.9} = tan\ \beta$. Therefore β = N 43° 43' W.

Measuring azimuths from the south, a bearing of N43° 43'W corresponds to an azimuth of 136° 17'.

Therefore $\rho = 136° 17'$.

$bR = \sqrt{(119.6)^2 + (238.1)^2} = 266.4$

Tangent of the bearing angle of $Rb = \frac{+119.6}{-238.1}$. therefore the bearing of the line *bR* is S26° 41'E and $\rho' = 333° 19'$.

$\rho = 136° 17'$ or 496° 17', i.e., (136° 17' + 360°). Therefore α = 496° 17' — 90° — 333° 19' = 72° 58'.

Tangent dip $(\theta) = \frac{154.5}{\cos 72° 58' \times 266.4}$.

Therefore $\theta = 63° 12'$.

The difference between the values of β and θ in the two solutions is due to measuring to the nearest 15' with the protractor.

*Mining engineer, Miami, Ariz.

Resoiling Dredged Areas

In order to prevent damage to land by dredging operations the Victoria regulations provide that where the soil and other earthly overburden are not less than two feet deep, such material shall be advance stripped to any depth that may be found down to seven feet below the surface, and from the face be conveyed either in a dry or moist state, but not in suspension in water, and distributed evenly with a flat grade on top of the coarse and fine material dumped from the boxes, and, unless otherwise directed, the newly formed surface shall be sown with approved grass seeds until they take root.

Where the overburden is less than two feet, the greatest possible quantity of the fine material from the excavation shall, by means of silt distributors and brush or other dams, be distributed and spread on the surface of the tailings dump with a flat grade, and unless otherwise directed, be sown with approved grass seeds until they take root. The management of one dredge states it is finding the cost of resoiling is just about the cost of dredging the gravel.

Mining Methods at the Pilares Mine, Nacozari

The Pilares de Nacozari mine of the Moctezuma Copper Co., in Sonora, was described in a general way in the JOURNAL, May 20, 1911. Since that time, however, a different method of stoping has been introduced, which is described by D. C. Livingston, in the September *Bulletin* of the American Institute of Mining Engineers.

The mine is opened by two 3-compartment shafts, situated one at each end of the elliptical orebody, and an adit tunnel about a mile long, which taps the deposit at a point about 600 ft. below the collar of the shaft. This adit is large enough to allow narrow-gage, 25-ton railroad cars to load from the mine chutes, and it is chiefly due to this cheap handling of the ore that the enterprise has become so commercially successful. The railroad runs to the top of the bins above the concentrator, which is situated on the Nacozari railroad, at the town of Nacozari, about five miles from the mine. From here the concentrates are shipped to the smeltery at Douglas, Ariz. The daily output of ore is between 1500 and 2000 tons.

The levels in the mine are 100 ft. apart; and the general plan is to use every alternate level as a stoping base, the intermediate levels being used for development, ventilation, and the distribution of waste to the stopes that are being filled. At the present time practically all the ore is being mined above the adit level, which is known as the "700," and at the present rate of output there should be, on a rough estimation, an ore supply of approximately 10 or 12 years above this level. The shaft at the north end has been sunk to the 1000-ft. level, and some work has been done on this level as well as on the 800- and 900-ft. levels.

Owing to the scarcity of timber in the neighborhood, and to the high price of imported timber, it has been necessary to adopt mining methods which would eliminate the use of timber as much as possible. The nature of the rock is such that while it is not hard to drill or blast, it stands without timber in a most remarkable manner in most parts of the mine. This characteristic of the rock has also prevented the using of the caving and top-slicing methods, which are being used so successfully in some of the mines at Cananea. Accordingly, some systems of underhand stoping had to be devised, and the following two methods are used: (1) The old method, Fig. 1, which is room-and-pillar, with waste filling as the work progresses. (2) The new method, Fig. 2, which is shrinkage with waste filling after all the ore has been extracted.

With the room-and-pillar method the mine plan is laid off into pillar lines at right angles to the strike of the ore and placed 50 ft. apart, dividing it into alternate stopes and pillars. A main working drift is run approximately parallel to the strike, and crosscuts are turned off every 100 ft. in the pillars. From these crosscuts right-angle headings are turned off every 50 ft., and run to the center of the stope; from these the sill floor is cut to the limits of the ore and to the pillar lines, making the stope 50 ft. wide. The roof, where necessary, is supported by pipes or cribs, and a 6-ft. cut is then taken upward with stoping drills, the blasted ore being drawn off immediately, and filling run in from the level above through winzes to within 4 or 5 ft. of the roof. The short drifts from the crosscuts are timbered through the filling, and cribbed chutes and manways are carried up from the ends of these. In a stope 150 ft. long, there would be three of these chutes and manways.

There were no pillars being extracted during Mr. Livingston's visit, and it was probably the apparent difficulties of removing these pillars without losing a large amount of ore by mining with waste, which led to the adoption of the new method.

With the shrinkage method, designed by C. A. Smith, the use of timber is almost entirely eliminated, as not even timbered chutes are used. Crosscuts are turned off from the main-haulage drift every 50 ft., parallel to the pillar lines, and extending to the limits of the ore.

The next step is driving what are called the "stopes," which are breasts 15 ft. wide and the height of an ordinary drift. These are driven parallel to the crosscuts, and midway between them, and are carried to the limit of the ore. From the crosscuts, "shovel ways" are turned off at right angles at intervals of from 20 to 25 ft., and are driven to connect with the stopes. Turn sheets are placed at the mouths of the shovel ways. The ground is now ready to commence underhand stoping. The stopes are carried up the same width (15 ft.) with stoping drills to a height of 20 ft. above the floor, and are then widened 10 ft. on each side, making them 35 ft. in width, with 15-ft. pillars in between.

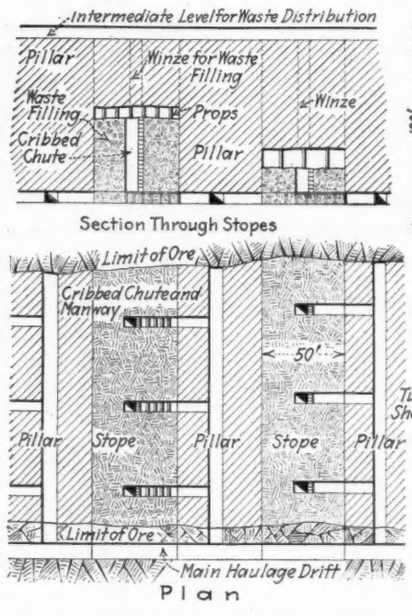


FIG. 1. ROOM AND PILLAR MINING

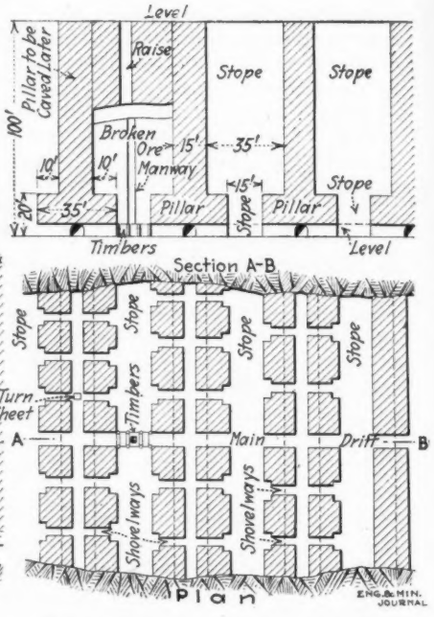


FIG. 2. SHRINKAGE SYSTEM OF MINING

The machines are set up on the broken ore, enough being drawn out through the shovel ways to keep a working clearance. The stope is continued up in this manner to the next stoping level. This work was started last summer, but it is evident that the main drifts will have to be timbered where the stopes cross them in order to keep the broken ore off of the track and cribbed manways, built up through the broken ore at these points, but aside from this, with the exception of an occasional prop, no timber is used at all. There would be no absolute necessity for manways through the broken ore, as the stope can be entered by means of the winze from the level above.

The shovel ways, which are merely rock chutes, have been used in the mine for a number of years in the narrower portions of the vein, instead of timber chutes. The reasons for their adoption

are: (1) No timber required. (2) Ease and safety in blasting large boulders, which can be more safely and easily blasted in the shovel ways than in the stopes, and without interfering with the work. (3) All work, except timbering, is done by contract with the natives, and it was found that unless all the rock was broken in the stopes sufficiently small to pass a chute readily (a difficult and expensive item in ground that breaks big where shrinkage is employed), it was just as cheap to have it shoveled into the car as to draw off from a chute that was continually hanging up, and the expense of the timber was also eliminated.

In mining the pillars in the shrinkage system, the plan is to put up raises in the pillars and from the raises to shatter the pillars with heavy shots, so that the pillars will cave when the ore is drawn out of the stope. If this method works out as expected, at least 95% of the ore should be recovered.

As regards the comparative cost of the two systems: Stoping in wide stopes by the shrinkage system had not progressed for a sufficient length of time in the summer of 1911 to warrant giving a complete comparison, but what figures were available pointed to a considerable saving in the shrinkage over the room-and-pillar system. This should be the case after the sill floor has been opened up, because, in the shrinkage system, there is no rock handled in the stopes until the ore is drawn out, whereas in the room-and-pillar system both the ore and waste filling have to be handled in the stopes in wheelharrows.

The miners of the Michigan Copper district wear a tight-fitting skull cap under their ordinary water-proof hats. It is made of light material and can be washed. They claim it keeps dust and dirt out of the hair and is more comfortable than an ordinary hat in a dry working place.

A California Dry Placer Dredge

By Percy E. Barbour*

A dry-placer machine, called a dredge by the builders, is illustrated in detail in the accompanying engravings. This machine was successfully used in the Marysville district, California, and was made locally at small expense. It thus had the two prime requisites for a machine for a small operator; ease and cheapness of construction and satisfactory operation.

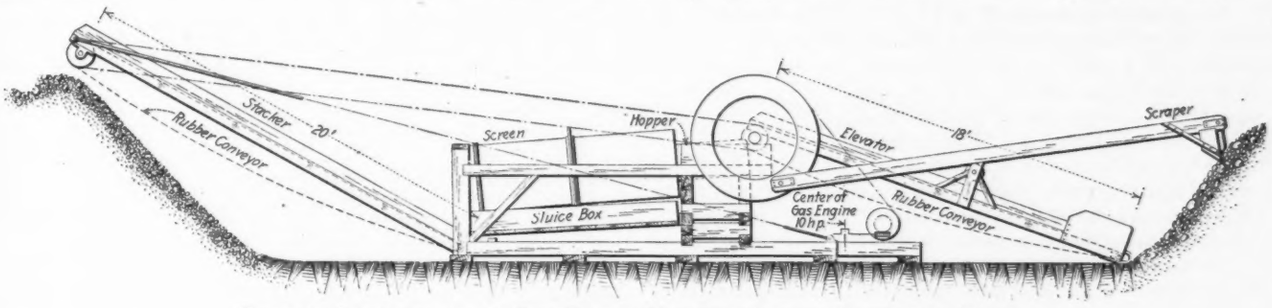
A general arrangement of the machine is shown in an accompanying engraving. A bull wheel operates a scraper arm, by means of a crankpin connection. The scraper rakes the gravel down to the foot of an 18-ft. traveling belt conveyor. This conveyor is operated from the bull-wheel shaft. The gravel drops from the head of the belt conveyor into a hopper, which inclines into a revolving screen of uniform mesh, the axis of which is set at a steep angle with the horizontal.

Underneath this revolving screen is the sluice box provided with the usual riffles. This sluice box is inclined toward the discharge end and the reject from it is effected by a bumping or shaking motion given to it by a shaking ring with cam-like teeth, which encircles the middle of the revolving screen. The screened gravel and the dry-washed gravel both discharge to the foot of another traveling belt conveyor, which stacks this tailing behind the machine.

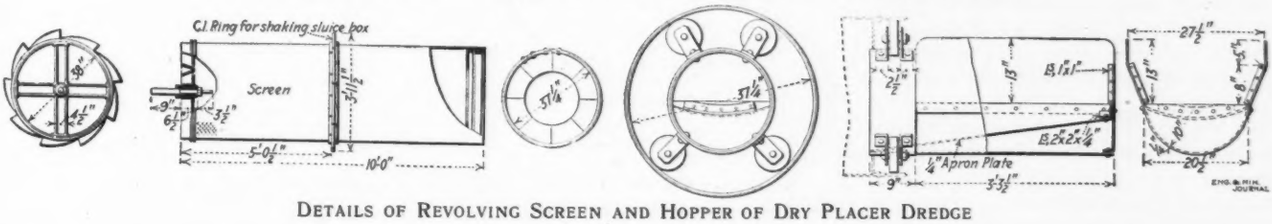
The entire framework is of light timber construction, and in this case the motive power was derived from a 10-hp. gasoline engine. In the feed-hopper construction, shown in the accompanying illustration, the most interesting feature is the manner of supporting the feed end of the revolving screen. The arrangement consists of four small rollers set off-quadrant and forming a part of the hopper. These rollers run inside the revolving screen, which has a plain strap-iron band riveted inside for a roller track.

The whole machine is self-contained, with its scraper, elevator and stacker. It is an interesting approximation of standard dredge practice to a dry placer, and reflects credit on the local miners who devised it.

*Manager, Uwarra Mining Co., Candor, N. C.



General Arrangement of Dry Placer Machine Used at Marysville, Calif.



Details of Revolving Screen and Hopper of Dry Placer Dredge

Detonator Troubles on the Panama Canal

Mining operations on the Panama Canal during 1907 involved the use of about one hundred 4-in. Star well drills and 150 tripod drills. Holes were spaced from 12 to 18 ft., with depths of 15 to 60 ft., blasting charges ranging from 200 to 1000 lb. of dynamite per hole, depending upon the class of material being mined. Serious troubles began to develop from the encountering by steam shovels of the unexploded dynamite. It was ascertained that this resulted from detonator failures and not from the quality of the dynamite, said A. L. Robinson in part, before the Eighth International Congress of Applied Chemistry.

Investigations were made to determine the cause of detonator failures. The heavy charging of holes and the condition of work often required detonators to be left in charged holes for 24 hours or more. It was discovered that some of the brands became saturated and the fulminate ruined after 24 hours, and while other classes did not absorb as much water, nearly all were found to have become affected.

The assumption that the drill-hole waters contained free acid which attacked the detonator shells seemed to have good foundation from the fact that a micro-

scopic examination after immersion showed minute holes just below the sulphur plug. A number of detonators and samples of the water from drill holes were then subjected to tests and examinations in Ancon laboratory, which showed that deterioration was not due to free acids, but primarily to the composition and construction of the exploder itself. The conclusions of these tests were: (1) That the kinds of water used for immersion made little difference in the net results when the same conditions of time of immersion and pressure were maintained; (2) that the number of failures to get a normal explosion of cap increased almost geometrically with the length of time of immersion and the hydrostatic pressure, and (3) that corrosion began on the internal portion of shell at or near the point of contact between sulphur plug and the loosely packed portion of the charge, usually opposite or a little above the level of the platinum bridge.

Detonator manufacturers were notified of the troubles encountered and two of these later developed and furnished detonators which proved practically impervious under heads of 40 to 60 ft. In one brand a composition or cement plug is inserted just above the loose fulminate and at the point where shell deterioration had occurred. Above this plug a black viscous compound is inserted and above this compound the usual sulphur plug is put in as a cap. If this sulphur plug causes any deterioration of shell, no leakage through deterioration at this point can reach and spoil the fulminate.

The other detonator is composed of a double jacket or shell. The inner shell contains the usual packed fulminate at the bottom, a small quantity of gun cotton, the bridge and the usual sulphur plug at the top. This inner shell is set into an outer shell, filled with a black compound, which completely envelops the inner shell. If inner shell is deteriorated by sulphur action, the outer shell and compound will prevent moisture reaching fulminate.

With impervious detonators it was assumed that accidents from unexploded dynamite would become matters of history. However, in the spring of 1908 the number of missed holes, and consequent unexploded dynamite dug up by steam shovels called for a careful study of all conditions which might in any way cause misfires. It was decided to investigate the power for exploding detonators.

After ascertaining that the batteries were sufficiently powerful, it was thought that the detonator troubles were probably due to the series method of connecting them in circuit. With only an instantaneous pulsation of current the explosion of a large number of detonators must be impossible unless they are so uniform in construction as to allow of their bridge being heated to the explosive point by the same amount of current with the same time element.

A study was then made of the two variables entering into the heating limits of detonator bridges. It was ascertained, (1) that with the time element of current flow constant, detonators exploded with variable amounts of current, and (2) that with current flow constant, detonators exploded under variable time elements. With this knowledge it was understood why a large number of detonators wired in series could not be counted upon to explode from a momentary current from a battery, even though that battery had fired one detonator through a resistance equal to the number of detonators for which battery was guaranteed. With 50 detonators in series, requiring a varying exploding current value, that detonator requiring the lowest current value to explode would be the first to break down, thus breaking the circuit, with the result of leaving detonators requiring high current unexploded.

The results of experiments caused eight miles of primary pole line to be built along the canal between Bas Obispo and Pedro Miguel, the installation of transformers every 1000 ft., and the stringing of secondary wire from transformers throughout the blasting districts in this territory. The use of batteries was prohibited throughout this section, except for springing holes and for such other light work as would not result in accidents in case detonators failed to explode.

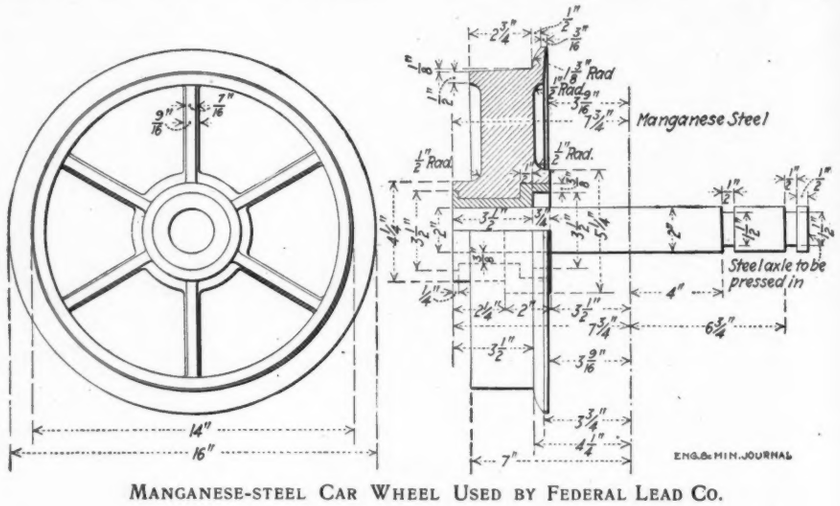
In all heavy mining operations detonators were connected in parallel to feed wires of No. 12 B. & S. gage, strung on stakes over the holes to be exploded. These feed wires were connected by blasting wiremen to the secondaries of No. 2 B. & S. gage wire which had been strung from transformers along the ground on portable trestles.

The installation of power lines and the adoption of the parallel wiring of detonators produced such an immediate reduction of missed holes and increased efficiency of explosives that this method was adopted throughout practically the whole of the canal construction.

The firing of detonators wired in parallel naturally requires a large current output and consequently a much more expensive current source than the ordinary hand battery. If the work is of sufficient magnitude to warrant such an expenditure, the danger to operators is greatly reduced, the efficiency of the explosives is largely increased and the general results obtained are much more economical and satisfactory.

Car Wheels for Sprag Braking

In the development of a flat ore deposit with an extremely irregular floor, such as is found in the lead district of southeastern Missouri, heavy and changing grades are frequently unavoidable. Where animal haulage is used in such mines, some method of holding the cars in check is necessary. The ordinary brake beam does not operate successfully on steep grades and the method sometimes used of making the animal help is hard on the animal.



MANGANESE-STEEL CAR WHEEL USED BY FEDERAL LEAD CO.

The method largely used in such cases is to design the car wheels with heavy spokes between which the driver shoves a pin so as to lock or sprag the wheel, causing the cars to skid down the grade with as many wheels locked as necessary. The driver picks up the sprag pins at the top of the grade and moves from car to car locking the wheels. On the return trip the pins are thrown off at the head of the grade.

Cast-steel wheels were used for a time by the Federal Lead Co., but proved unable to withstand the severe shocks caused by spragging This company has now adopted manganese-steel car wheels of the pattern shown in the accompanying drawing. These wheels are used on 1.4-ton cars and no trouble has been experienced by their failure.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

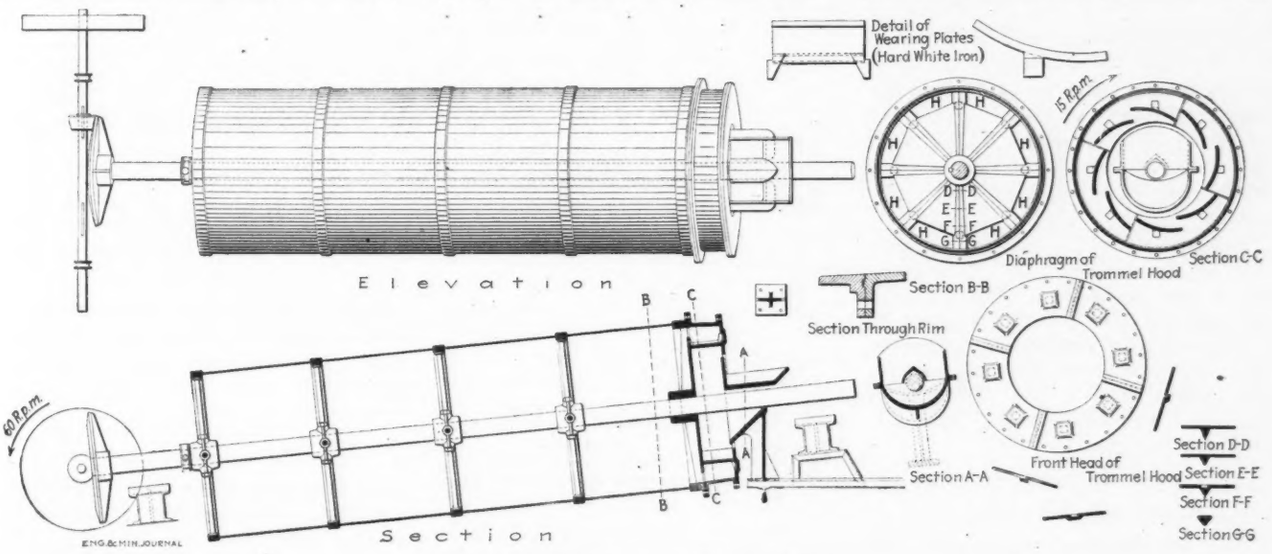
Copper Blast Furnace Settlers

Large settlers are now commonly used for receiving molten matte and slag from modern copper-blast furnaces. They are either round or oval in shape, the round ones often being 16 to 18 ft. in diameter and 5 ft. deep, while some of the large oval settlers are 22 ft. long, 14 ft. wide and 4 ft. deep. A better separation of matte and slag is claimed for the oval settler as the slag enters near one end and discharges at the other after traveling a distance of about 18 or 20 ft. These large settlers are lined with chrome brick with a backing of ganister or converter lining. Chrome brick is generally preferred to either fireclay or magnesia brick on account of its durability. It is practically unaffected by any of the slags or mattes met with in copper smelting although it is possibly not quite so effective in withstanding the chemical action of some mattes and slags as magnesia brick. But chrome brick will withstand variations of temperature without scaling off as magnesia brick is liable to do. A chrome brick which has given much satisfaction in copper work has an approximate analysis as follows: Silica, 3%; alumina, 24; ferric oxide, 16%; magnesia, 14%; chromic oxide, 40%.

In one of the best designed copper plants consisting of three large blast furnaces, oval settlers are used 18 ft. long, 10 ft. 6 in. wide and 4 ft. 6 in. deep. They are placed between the furnaces and at each end of the line, making four in all. This arrangement permits of repairs to any furnace or settler without interfering with the work. The settlers are lined with chrome brick and are cooled externally when necessary by sprays of water running down the steel sides. The slags are noticeably cleaner than before, when smaller settlers were used.

Trommel for Coarse Dry Ore

Experience showed the management of the Doe Run Lead Co., that there had been considerable wear and tear on the front legs and the first section of the trommels used for screening the southeastern Missouri lead ores when handling the undersize from a 1-in. trommel, owing to the impact of the falling ore.



DOE RUN TROMMEL FOR COARSE ORE

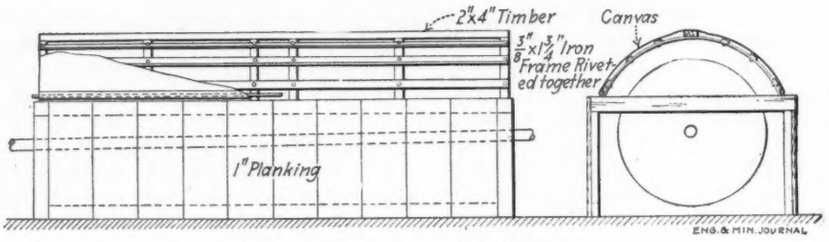
On that account, H. R. Wahl, mechanical engineer of the Doe Run company, designed a trommel with a diaphragm hood with wearing plates as shown in the accompanying drawings. The feed hopper is carried on a pedestal. Around this and making a loose fit is the front head of the trommel hood. This annular front head, formed by bolting together four castings that overlap one another at the joints, is in turn fastened by bolts to a flanged separator ring or shell that meshes with a groove in the side of the diaphragm to which it is bolted. This diaphragm has reinforcing ribs raised on the back. The material between these ribs is cut away near the rim or flange to provide the holes *H*, through which the ore feeds to the trommel screen. Between the two heads of the hood are placed wearing plates held in place by square wings that fit into recesses in both heads of the trommel hood. These wearing plates have a slope in a direction opposite to that of the rotation of the trommel so that the ore as it feeds from the hopper or feed chute strikes the wearing shoes and slides gently down upon the shell of the trommel hood; in this way the life of the separator shell as well as that of the diaphragm or back head of the hood is greatly lengthened.

The only drawback to this form of hood is that the wearing plates are somewhat difficult to replace and the ore, if damp, tends to stick to them. On that account the trommels are now used with practically no wearing plates. It might be possible to arrange the wearing plates so that they would be held in raised grooves on the two heads, by bolts, and so could be replaced by removing the holding bolts instead of taking off the front head. They could be designed so as not to come quite so near the bottom.

The idea of the wearing plates, though, seems good. The ore is made to fall gently upon the bottom of the trommel, and excessive wear on the legs of the trommel spider as well as on the first section of screen is avoided. The hood diaphragm is also of service in preventing the scattering of dust through the mill. It has been found that the trommel is somewhat longer than necessary, as practically all the undersize is screened out on the first two sections; the

third section prevents much undersize going over with the oversize to the re-crushing rolls.

Escape of dust from the trommel through the perforations is prevented by carrying up from the floor on which the trommel is placed, a frame of 2x4-in. timbers with a casing of 1-in. planks. Over the top is placed a covering of canvas which is supported upon a framework of six, 1¾x⅜-in. iron bands, that spring from the side frames which are tied together with a wooden center rib and six straps of 1¾x⅜-in. iron as shown in the accompanying drawings. The two center bands are close together owing to the fact that the canvas covering is lapped at that point. This covering is held down on the canopy frame by ¾-in. rods that run through hems; one along each of the bottom edges. This makes it easy to lift up the covering and inspect the trommel at any time while escape of dust is prevented.



HOOD USED ON DOE RUN TROMMEL

Manganese-steel screens are being tried on this trommel. They have openings 9 mm. in diameter. For a time it was impossible to get any company to undertake making screens of manganese steel. The manganese-steel screens have been used only a few months so that it is impossible to state what service they will give.

Slope of Launders

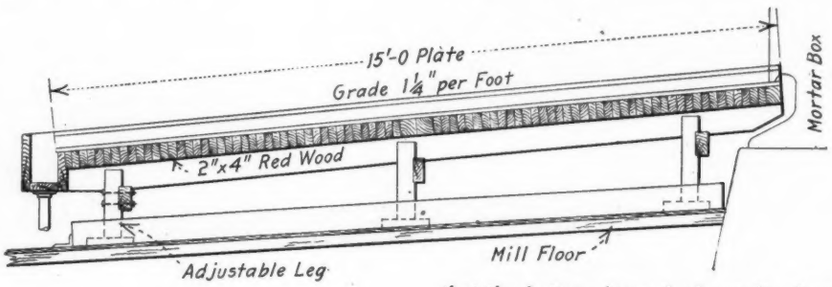
The accompanying table, containing data concerning the fall of launders for different classes of material, is taken from a description of the mill at the Lucky Tiger mine, El Tigre, Sonora, Mex., by D. L. H. Forbes (*Bull*, A. I. M. E., August, 1912.) Anyone who has been called upon to design a launder system will appreciate the practical value of this sort of information.

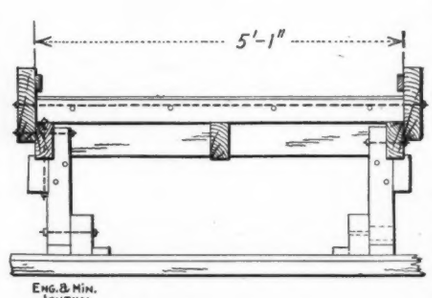
LAUNDER FALLS USED IN NO. 2 MILL OF THE LUCKY TIGER MINE

Situation	Size		Dilution of Pulp S:L	Fall, Per Foot
	width	hght.		
	In	In.		In.
Stamps to classifier	8	8	1:6	½
Classified coarse sand to Wilfleys	6	6	1:3	½
Classified fine sand to Wilfleys	6	6	1:3	¾
Slime to dewatering tanks	8	8	1:20	½
Thickened slime to Deister tables	6	6	1:4	¾
Sand tailings from Wilfley tables	8	8	1:5	1
Middlings from Wilfleys to pan	4	4	1:2	1
Concentrates from Wilfleys to bin	4	6	....	1½
Slime tailings from Deister tables	6	6	1:7	¾
Middlings from Deisters to 4th table	4	4	1:4	¾
Concentrates from Deisters	4	6	....	1½

Rand Amalgamation Tables

Since the advent of coarse crushing in practice in many of the mills on the Rand, amalgamation tables in front of the stamp batteries are not used, but shaking amalgamation tables are used in the tube-mill circuit. Before coarse crushing was adopted, however, stationary or movable amalgamation tables were used in front of the stamps. These tables were built, as shown in the accompanying illustration, of a series of transverse battens, held together by longitudinal tie-rods. The table thus formed was supported upon foundation posts and beams as shown in the illustration. The pulp was confined at the side, by the sideboards attached to the table bottom.





TYPE OF STATIONARY AMALGAMATION TABLE USED ON THE RAND

Formerly it was the practice to use a number of copper plates on the table, the end of one overlapping the plate next below, but the later practice is to use but one sheet of copper on the table; this usually is about 12 ft. long and 4½ ft. wide, or slightly wider than the screen frame of the battery. In some mills the amalgamation tables are arranged so that they can be moved on rails a short distance from the mortar box, in order to gain access to the stamps, without interference from the tables. In other mills the supports of the tables were built upon wedges so that the grade could be made greater or less as might be desired.

The copper plates are turned up at the edges, in order to prevent leakage which would be liable to cause warping of the top of the table and distortion of the copper plate. A cleat or fillet of wood is nailed to the sideboard of the table to hold the copper plate in position. The plate is extended up underneath the discharge lip of the mortar. As the lip of the mortar box is equipped with a drip strip on the under edge, and the upper edge of the table is turned up, no leakage can take place.

This table is somewhat similar to the amalgamation table used at the Alaska-Treadwell mills described in the JOURNAL of Apr. 27, 1912; the notable difference is that the battens instead of running longitudinally and being tied together by transverse rods, run transversely and are tied together by longitudinal rods.

A Pilot Concentrator

An interesting and useful idea for concentrating mills has been put into operation at the mill of the Coniagas Mines Co., Ltd., at Cobalt. It consists of designating one concentrator as a pilot, which gives an accurate idea of how the mill in general is operating. A sample is cut automatically from the tailing as it goes to the dump and this sample is sent back to the pilot table where it is reconcentrated. If the mill is not doing the best possible work a further recovery is shown on this table, while if all the tables are doing good work the pilot will not show any additional recovery. Thus a glance at it will show at any time just how the mill is being cared for. The idea originated with Frazer Reed, mill superintendent for the Coniagas company.

At the Tom Reed mill, Oatman, Ariz., lime emulsion is added to the pulp as it flows from tube mills to thickeners, the amount being determined by alkalinity tests on the mill solution.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Shaft Sinking at Goldfield

The following figures show the cost of sinking a shaft 100 ft. deep during the early days of the Goldfield district in Nevada. All the work was done by hand and at the time wages and supplies were higher than at present.

The shaft was on leased ground and was started at a point where rock was encountered near the surface. All drilling was done by hand although augurs were used much of the time for putting down the holes, as the rock was soft. The sinking and timbering to 100 ft. required 60 days from the time ground was broken. Wages were $4.50 per shift of eight hours. All hoisting was by windlass.

The shaft was a double compartment one, each compartment being 4½x4½ ft. in the clear. The timber used was Oregon pine and it cost $40 per M., delivered on the ground. The shaft timbers were all 8 in. square, with the exception of the center side posts and the center cross-pieces, which were 6x8 in. The sets, which were framed by hand, had 5-ft. centers and were solidly lagged with 2-in. plank.

COST OF SINKING 100-FT. SHAFT AT GOLDFIELD

	Total Cost	Per Foot
Labor	$1255.50	$12.555
Timbers	542.34	5.425
Explosives	138.33	1.383
Tools and supplies	92.61	0.926
Office expense	9.75	0.097
Total	$2038.53	$20.384

When the work was completed the shaft was 106 ft. deep and timbered to 100 ft., this being in accordance with the terms of the lease.

Shattuck-Arizona

The annual report of the Shattuck-Arizona Copper Co., Bisbee, Ariz., for the year ended Aug. 1, 1912, states that the development work for the year amounted to 4942 ft., consisting of 2863 ft. of crosscuts, 938 ft. of raises, 108 ft. of winzes and 1033 ft. of intermediates. No stoping was done and the 2802 tons of ore produced were taken from development. According to this, the development produced one ton of ore for every 1.76 ft. of development work performed. The wet weight of the ore was 3094 tons, indicating 9.45% moisture. A smeltery has been planned to be erected at Douglas, and will have a capacity of 400 tons per day, the estimated cost is $400,000, which is equivalent to about $2.77 per ton of annual capacity. In the converter department of a neighboring smeltery, it is stated that a saving of 20c. per ton of ore smelted was effected by using basic-lined instead of acid-lined converters.

Las Dos Estrellas

The total cost of mining and treating ore during the year 1911, at the mines of the Cia. Minera Las Dos Estrellas was 10 pesos per ton, according to the official report of the company. This company operates mines in the Tlalpujahua district, State of Michoacan and in the El Oro district, State of Mexico, Mexico. During the year under review 479,723 metric tons of ore was mined, crushed in the stamp mills, one of which contains 130 the other 120 stamps, and cyanided. In addition 166 tons of rich ore was shipped to the smelters. The total cost of 10 pesos per ton was made up of the following items: Development, 1.35 pesos; mining, 4.13; crushing, 1.05; cyaniding, 1.92; asaying, 0.10; cost of selling products, 0.42; taxes and duties, 0.38; and general expenditures, 0.65 pesos.

The item of 4.13 pesos for mining includes the cost of breaking ground, 2.210 pesos; tramming from the stopes, 0.380 pesos; general haulage of ore in underground haulage ways, 0.191; maintenance of underground openings, 0.661; ventilation, 0.043; surface, 0.211; railroad transportation, 0.055; sampling 0.025 and general expense 0.354 peso per ton. In mining 8x8-in. or 10x10-in. timbers are used in square sets which are filled with material brought into the mine through the several adits and one of the shafts, and with the rock mined with the ore in the upper levels. In the upper levels practically all the ore is mined, while in the lower levels pillars of low-grade ore are left whenever the grade of the material is too low to pay the cost of its removal. All tramming in the mine is done by hand; the general hauling through the adits is done by nine electric locomotives of 15 to 25 hp. The hauling outside the mine is done by one 200-hp. electric and one steam locomotive. Natural ventilation through the numerous adits and shafts is supplemented to a great extent by two Geneste-Herscher aspirating fans of 65 hp. capable of removing 15,000 liters of air per minute. The cost of development for 1911 exceeded that of 1910, 1.35 compared with 1.125 pesos per ton, principally because of the necessity of working through a greater number of shafts as greater depths were attained.

The total cost of 1.05 pesos for crushing was made up of the following items: General expenses, 0.0377; breaking 0.1384; stamping, 0.4442; tube milling, 0.4283. The cyaniding cost of 1.92 pesos comprised: Labor and power, 0.7782; cyanide, 0.5153; lime, 0.1350; zinc, 0.1423; sundries, 0.1932; and filter pressing, 0.1586 pesos per ton of ore treated.

The consumption of cyanide was 0.6516 kg. sodium cyanide; of lime, 14.03 kg. and of zinc 0.479 kg. per ton of ore treated. In one mill 89.9% of the gold and 71.1% of silver in the ore was recovered; the corresponding figures for the 120-stamp mill were 88.9% and 52.6% respectively.

The traffic on the railroad amounted to 86,525 tons of ore and 50,193 tons of merchandise, fuel, lime, etc. The cost per ton moved was 0.388 peso. While the average number of employees was 5688, only 193 were injured in accidents and but 335 received medical treatment from the company's physicians. The company maintains three schools for the children of its employees, in which 231 students were enrolled.

Unit Costs at Ohio Copper

According to data supplied by Alfred Frank, general manager, the unit costs at the Ohio Copper Co.'s mines, Bingham Cañon, Utah, are as follows: A month's record shows that 59,000 tons of ore was mined, 55,000 tons coming from stopes and 4000 from development work. Mining is carried on by the caving system and as indicated by the tonnage record 93% of the ore mined comes from stopes and 7% from development. In mining this tonnage 3144 shifts of labor were employed, distributed as follows: Advancing in development, 277; mucking and tramming, development, 277; timbering, development, 40; mining ore, 1330; timbering, mining and general repairs, 260; miscellaneous men underground, 540; and surface men at mine, 390 shifts. The ore now being mined lies above the main tunnel and, after caving, is dropped through chutes to the tunnel. The rock is medium-hard quartzite and according to the figures stated the average output, including ore from development, secured per man per shift is about 19 tons for every man employed at the mines, 37 tons per man engaged in extracting ore, 995 tons per man employed in develop-

ment, 1095 tons per man employed in miscellaneous work underground and 1510 per man employed on surface. Based upon the men employed in extracting ore and tons drawn from caved area, the average tons per man per shift was 34.6 tons per man mining and timbering or about 41.3 per man mining and 212 tons per man timbering. Based upon the ore secured from development and men engaged in advancing and mucking and tramming, approximately 6.8 tons were secured per man or 14.4 tons per man advancing and 14.4 per man mucking and tramming and 100 tons per man engaged in timbering.

The dynamite consumption in extracting ore was 12,500 lb. or about 4.4 lb. per ton of ore produced from stopes. Timber consumption was 25,000 bd.ft. for mining and general repairs or 1 bd.ft. for every 2.2 tons of ore from stopes. In addition to this 7000 bd.ft. were used in development, making a total consumption of 1 bd.ft. for every 1.84 tons of ore produced from development and stopes. The main drifts and stations are lighted by electric lights, the average candle consumption is four per man in 8 hr. In ore extraction 965 machine drill-shifts were run, indicating that 57 tons are secured per machine-shift. In development 235 machine-shifts were worked, making a total of 1190 shifts or about 44.6 tons of ore produced from development and stopes per machine drill-shift. About 540 lb. of drill steel is consumed per month or 1 lb. for every 109.5 tons of ore produced.

The drills in use at this property consist of Holman, Sullivan, Ingersoll-Rand and Waugh stopers. On an average of three large and seven small piston drills and 12 hammer drills are used per shift. In drifts an average of seven 3.5-ft. holes or 24.5 ft. are drilled in 8 hr., allowing for two set-ups of ½ hr. each. In the stopes in an 8-hr. shift an average of 39 ft. or six 6.5-ft. holes are drilled with Waughs and 50 ft. or five 10-ft. holes with 3.5-in. Sullivan drills. In long raises the machine man has to put in ladders and stulls and will drill a round of 5.5-ft. holes in 8 hr., while in short raises he will average two 4-ft. rounds, placing no ladders or stulls.

In the shop a Numa drill sharpener is used and two men working 9 hr. each sharpen on an average of 280 drills. The air to the forge is furnished by an electric-driven Ingersoll-Rand air compressor and 170 lb. of coke is consumed or about 0.67 lb. per drill sharpened. Lubricating oil for drills is consumed at the rate of one-half pint per shift on piston drills. In running a 6x7.5-ft. drift, one man will average 3 ft. advance per shift of 8 hr., drilling approximately five hours with air pressure at 80 lb. and timber being placed by the regular timber crew. This is at the rate of about 17 cu.ft. of drift per man-hour. In raising, one man, placing no timbers, will advance a 4x5-ft. raise 5 ft. in 8 hr., drilling about five hours per shift. This is equivalent to 12.5 cu.ft. of raise per man-hour. In loading cars no shoveling is done from a rock bottom. One man shoveling from a plat into a 2.15x2.4x4-ft. car and tramming 100 ft. will average 16 cars in 8 hr., which is equivalent to two cars or 41 cu.ft. of rock per man-hour. Loading from a chute and using the same size car, one man will tram on an average of 80 cars 150 ft., which is equal to 10 cars or 206.4 cu.ft. per man-hour. The average life of a mine car at this property is about four years.

Iron Mining on Western Marquette Range

The Western Marquette iron range is situated in Baraga County, Mich. The mines of this district are of no great importance, and as a whole, have been unprofitable to the operating companies. The Imperial mine of the Cleveland-Cliffs company is the most important mine of the district; the only other mines of any consequence are the Portland and Ohio, of the Niagara Iron Mining Co., and the Beaufort mine. The total reserves of the district were reported to be 2,064,000 tons, of which the Imperial was credited with 1,500,000 tons. During a five-year period, 1906-1910, inclusive, the above mines shipped only a little in excess of 650,000 tons of iron ore, and were operated at a loss of $98,555 to the operating companies. During this period the average cost of production and delivery to lower Lake ports was made up as follows, basing the average value of the ore at 100%: Mining, 52.5%; development and exploration, 8.2%; construction, shafts, machinery etc., 0.3%; general expenses, administration, etc., 2.5%; royalties, 7.1%; taxes, 0.3%; rail freights, 12.5%; lake freights, 23.2%; and commissions, 2.4%, making the total cost 109% of the average value of the ore.

New York Tunneling Bids

The bids of 20 different contracting concerns made public by the Public Service Commission for construction work on the new subway extensions in New York City for routes 11-B Section 1, 11-B Section 2, and 18-22 Section 1, disclose a wide difference of opinion as to the cost of performing the work.

The Degnon Construction Co., 60 Wall St., New York, was awarded the contract on the first two routes and John F. Stevens Construction Co., 55 Wall St., New York, on the last named route.

On route 11-B Sec. 1, of 14 bids the range in price was from $1,930,258 to $3,248,449, a difference of $1,318,191 or 68%. On route 11-B Sec. 2, of 16 bids the range was from $1,904,717 to $2,996,406, a difference of $1,091,689 or 57%. On route 18-22 Sec. 1, of 12 bids the price ranged from $2,253,281 to $3,271,542, a difference of $1,018,261 or 45%. In each case the contract was awarded to the lowest bidder.

It is interesting to note the wide difference in the bids for certain specifications. For excavating 176,500 cu.yd. of earth the bids were from $2.20 to $4.25 per cu.yd., three were for $2.75, one at $2.88 and two at $3 and the other five above $3 per cu.yd. On a 1000-cu.yd. job of earth excavation the prices ranged from $2.45 to $8 per cu.yd. Three were not above $3.50, while the remainder ranged up to $6 per cu.yd., except in the single instance—the $8 bid. On 189,000 cu.yd. of rock excavations the range in bids was from $3.15 to $5.75 per cu.yd., while the average bid was $4.44. On 41,500 cu.yd. of concrete masonry the bids were from $7.50 to $9.25 per cu.yd. The same differences occur in all the bids

East Butte

The annual report of the East Butte Copper Mining Co., Butte, Mont., for the fiscal year ended Mar. 31, 1912, states that 95,910 tons of ore were mined at a cost of $4.14 per ton, including development work. In addition to this tonnage, which assayed 5.62% copper, the company purchased and treated 47,135 tons of custom ore. The total metal production from all ore was 12,167,363 lb. of copper, 396,524 oz. of silver and 17,959 oz. of gold. The total value of these metals was $2,184,758. The average price received for the copper was 13.21c. per lb., for silver, 55.016 per oz., and gold $20 per oz., all delivered at New York. The total cost of mining, treatment, freight, selling and refining, and cost of custom ore purchased amounted to $1,728,563. Interest amounted to $148,234 and additions to equipment $51,318. After deducting these amounts, a profit of $256,643 was left, which makes a net profit of about 2.11c. per lb. of refined copper. The profit of 3.75c. per lb. given in the report refers to the operating profit. The 2.11c. profit is the profit appliable for dividends. With the average price received for copper at 13.21c. per lb., the above indicates that the actual cost, covering all expenses, was approximately 11.10c. per pound.

The development work consisted of 7865 ft. of drifts and crosscuts, which is equal to about one foot for every 12.2 tons of ore mined. Among the improvements added were a dust chamber and stack base, which were constructed almost entirely of blast-furnace slag at a saving of about 70% over the usual cost. A sintering plant, erected at a cost of $15,000 for the treatment of flue dust by the Dwight-Lloyd process, is claimed to be effecting a saving of about one-half in the cost of treatment of flue dust.

Iron Mining on the Mesabi Range

By A. L. Gerry*

The Mesabi district covers an area of 400 square miles. The hematite ore bodies are generally capped and underlaid by ferruginous chert. The range is practically covered with glacial drift, making prospecting difficult. Exploration was formerly by test pits but now is largely by drilling, the orebody being completely determined before mining is begun. Open-pit mines are in the majority; where underground mining is adopted the top-slicing system prevails.

*Superintendent, Longyear Mine, Hibbing, Minn.

The Mesabi district (Mesabi being the Chippewa Indian name for giant) is about 400 square miles in area. It extends from east of Pokegama Lake, in T. 142 N., R. 25 W., in a northeasterly direction to Birch Lake, about 110 miles distant. In width it varies from two to 10 miles.

Glacial Drift Covers District

Practically the whole region is covered with glacial drift, showing outcrops at few places. The average depth of the surface overburden is, perhaps, 100 ft. The range is mostly made up of granite of Lower Middle Huronian and Keweenawan age, and to a lesser extent of Archean igneous rocks. South of the igneous backbone or main ridge occur Lower Middle Huronian sedimentary rocks in places. South of these, or of the Archean, where Middle Huronian are lacking, are Upper Huronian sedimentary rocks, dipping south and underlying the southern slope of the range. All of the formations are separated by unconformities.

A generalized north-and-south section, taken across the range, is shown in the accompanying engraving. *A* to *B* represents the highlands, and *B* to *C* the southern slope. A complete and detailed description of the geology of this district is given in the U. S. Geological Survey, *Monograph* LII, by Leith and Van Hise, and the illustration is taken from it.

At intervals more or less frequent throughout the range, but with no apparent correlation, the orebodies of hematite are capped with taconite, or ferruginous chert and often underlaid with the same material. This underlying taconite is in turn underlaid with quartzite. It is common to find a stratum of altered slate called "paint rock" (soft red clay), from six inches to two or more feet in thickness, between taconite and ore.

Another occurrence commonly found is a thin layer of white siliceous material between ore and paint rock. So uniform is it in some instances, that when near the top of the orebody, the miners look for the white seam as an indication that the top of the orebody has been reached.

In general, it may be assumed that when the quartzite has been penetrated in drilling, the bottom of the orebody has been reached. This has been proved untrue, however, in several instances, one of which is shown by drilling in S. 33, T. 58, R. 20 W., where quartzite is found underlaid by ore, which is in turn underlaid by quartzite, showing two bodies of ore, or more likely the same orebody divided in two parts.

The presence of glacial drift is, of course, a hindrance to exploration, but the fact that the ore occurs so near the surface makes this work much easier than in other districts. Nowhere in the district is the overburden more than 500 ft. thick, the average being from 100 to 300 feet.

As early as 1890 some intelligent and successful exploration work was done by means of test pits. These pits were usually 5x5 ft. in section and lagged up in the old-fashioned, log-house style. For several years exploration was carried on in this manner and is employed even to the present day for exploring in open-cut workings. In ore, 2x4-ft. test pits are put down without lagging for about $1.40 per ft., by contract. Only test pits in surface material are lagged, those in ore being shallow (usually for exploration for the season's work), do not require lagging.

Diamond drilling is the method of exploration now in use. Holes are put down vertically, usually 300 ft. apart, until the orebody is struck, when the holes are put down more frequently, as in 100-ft. squares or closer. From the data thus obtained, the mine is laid out on paper, before any work is done. This accurate determination of the orebody enables the attack on the orebody to be carried out systematically from the beginning of operations until the ore is completely mined out.

Contractors charge from $3 to $3.50 per ft. for churn drilling, and from $5 to $6 per ft. for diamond drilling. The cores, samples, etc., are saved and kept on file with their analyses and depth records. Churn drilling is resorted to until through the drift; the hole is then cased with pipe and a diamond drill used until through the taconite. The ore is usually churn drilled.

In determining the method of mining to be employed, the following considerations are essential. From drilling data the thickness of the overburden and also the thickness of the orebody are known. Taking a square foot for example, to the given overburden depth, gives *X* cubic yards of material to handle, at a cost of *B* cents per yard (from 14 to 30c.), depending on the material. We now have uncovered (theoretically) 1 sq.ft., times depth of ore, or *Y* tons of ore. The saving on handling *Y* tons of ore by open-pit methods (instead of by mining underground), is *C* cents per ton. If there is enough ore, so that $C \times Y$ is greater than $B \times X$, then stripping will pay. Plant equipment in both cases is, of course, figured in the above calculation.

Open-pit Mining Chiefly Used

Open pits are in the majority on the Mesabi Range, and vary in size from the smaller ones of 20 acres to the Hull-Rust, Sellers and Burt (opened together) of about 400 acres extent and having many miles of track in the pit and to the dumps.

Generalized Section across Mesabi Range

The track is nearly all of standard gage, and the steam shovels range from 60 to 120 tons, and are of all makes; the Bucyrus and Marion shovels being, perhaps, the predominant makes. Dippers are from 2½ to 5 cu.yd. capacity, four teeth being used in nearly all the stripping work. Some of the companies, however, use three teeth in dippers, when in the ore.

The open-pit mining is not especially different from any open-cut work. Ground is loosened up ahead of the shovel, if not clay, by gopher-hole blasting with black powder. Gopher holing is simply putting holes in the bank horizontally, with long-handled shovels, jumpers, etc.

The distance to which the hole is put in depends on height of bank, or depth of cut. The holes are fired with a battery, and it is considered good work if the blasted bank comes down to the loading track, but does not cover it. Some pits are worked in a series of spiral cuts, as shown in the accompanying halftone of the Mahoning mine, which is one of the largest in the district.

In general, stripping is done a season ahead of loading when possible, in or-

der that pit grades may be conserved and that the pit will not be crowded. It is not considered good practice, when the pit is a small one as 40 acres, to commence shipping before stripping is completed, unless for some extremely urgent reason the ore is needed. Boulders are drilled by hand, and steam drills, blasted with dynamite (40 to 60%) and loaded by shovel with the dirt.

It is usual to have a crew of men laying track in the cut following up the shovel, so that when the shovel has reached the end of the cut it can be moved back without loss of time. This track is in turn used as a loading track. Cleaning at the top of the ore is done by teams and scrapers unless the contour of top of ore is regular.

Hand- and air-dump cars are used. The latter, of course, do away with a great amount of labor, expense and delay in dumping; they can, therefore, get back to the shovel much quicker than the hand-dump cars. The air-dump cars used are 12- and 16-yd. cars, made by Western Wheel Scraper Co., and the Kilbourne & Jacobs Company.

Contractors do a large amount of the stripping on the range and costs of stripping vary from 14 to 30c. per yard, depending on the material, contractors' prices being about 30 cents.

To sum up, the successful operation of the open-pit method is, in a large measure, due to efficiently handled labor and outfit, and to the smooth working of transportation or railway systems in conveying excavated material to dumps.

Varied Surface Equipment for Underground Work

Surface equipment is of a varied nature, ranging from the old-fashioned massive wooden headframe, to the modern steel A-style shaft house, and other equipment of the same comparison.

The power plants are not much different from those in the other districts, with the exception that horizontal fire-tube boilers are the ones principally used throughout the district. Hoists are in general of the geared type, but of late, notably at the Morton and Scranton mines, first-motion hoists are installed.

Both of these mines have uptodate equipments, steel headframes, first-class power plants, etc. The hoists at both the Scranton and the Morton are first-motion hoists manufactured by the Wellman-Seaver-Morgan Company.

The Scranton has a battery of six 150-hp. boilers manufactured by S. Freeman & Sons, Racine, Wis. The steam pipes are carried in a concrete tunnel from the boiler house to the engine house and pipes are thus concealed below floor level, except for vertical goose-neck connections. A Ridgway dynamo, 125 kw., 455 amp. and 275 volts, operating at a speed of 250 r.p.m., is installed to furnish light and power for electric haulage. The compressor is an Ingersoll-Rand, class *C*, with air cylinders 14¼—33¼x30 inches.

The "drys" or change houses offer some novel ideas. The most modern are of concrete, or at least have concrete floors. They have individual steel lockers and are well ventilated. Some of the companies have gone so far as to have two lockers, one for underground clothes and one for street clothes. In connection with the lockers for underground clothes above mentioned is an artificial-draft system of ventilation, which does away entirely with the noxious odors common to drys. Two men use the two lockers in conjunction, having their suits of ordinary clothes in one locker and mining clothes in the other. Each man has his own wash basin. Between the rows of lockers and at right angles to them (the lockers being across the building) is a system of hot- and cold-water faucets, the piping running lengthwise of the building. Shower baths are also a feature of the modern dry.

Open Cut Workings at Mahoning Mine,

The warehouses offer no new features except that the Bowser tank system of handling oils is in common use. While it is an expensive installation, it is undoubtedly a money saver in the long run. Steel water towers are the most common, being of the combination hemispherical cylindrical type. Cooling towers for condensing water do not seem to be prevalent on the range.

Top-slicing Usual Method

The usual and in fact the only method of underground mining used, to

my knowledge, is the top-slicing method. The ore is removed in 8-ft. slices vertically (more or less depending on conditions) from the top of the orebody downward, the gob or surface material following the slices down, and resting on the ore yet in place (usually separated from it by boards, laid in the bottom of a room before blasting the supporting timbers). It is also removed in 8-ft. slices horizontally, retreating from the property or shore line, toward the shaft.

Pillars are usually about 50 ft. through, and no more crosscuts are driven than are absolutely necessary for ventilation, etc., in order that the orebody be cut up as little as possible.

The shaft is usually put down in ore as it is impracticable to put it in barren rock. In the best practice it is put down to the bottom of the orebody, permanent haulage ways, pump station, etc., being established. It is a great saving of time and expense to have this done once and for all.

Developing a Shallow-sloping Orebody

In the engraving on page 696 is shown a plan and side elevation of a method of working a shallow, sloping orebody, which is perhaps the most difficult kind to handle that is encountered on the Mesabi range. It involves handling the ore three times, and a small portion four times. This is actually done and the cost kept below a dollar per ton.

We will say, for instance, that the property consists of a 40-acre tract, 20 acres *ABCD*, as shown, and 20 acres south of line *CD*, but not shown. We will assume that the ore has a general pitch of about 9% south, and has an average thickness of 36 ft. *AB* is the north line of the property, and the thickness of the deposit is measured normally to the dip. We would probably sink a three-compartment shaft, 6x18 ft. inside dimensions, at the center of property. Main motor haulage way *EE* would be driven and at the same time raises put up to the top of the orebody at *F* as shown and crosscut *F* would be driven directly over *E*.

Drifts would be driven north from *F* to *G* and connections made as soon as possible with timber shaft *X* to get ventilation. Crosscut *F* and drifts *FG* could be driven without timber, even in the comparatively soft Mesabi hematite if dry. They would be 5x6 ft., and arched at the top. Perhaps in a few places one or two sets of timber would be needed. This system of drifting is employed at Monroe mine, at Chisholm, and at the Harold and Webb mines, at Hibbing.

The next step would be to drive inclined raises to the 73-ft. level and raise timber shaft *Y*. Drifts *HJ* would not need timbering if 5x6-ft. drifts. Square-setting would be started at property line on the 73-ft. level as shown, caving retreating toward *H*. When the back gets as low as 16 ft. the square sets could be abandoned.

In the meantime the 91-ft. level would have been driven to the property line without timber. The east side of the 91-ft. level drifts would be over the center of the 107-ft. level drifts for convenience in putting up raises. To assist the rapid development of the 91-ft. level it could be driven 4x5 ft. in section without timber, to a point somewhere beyond *N*, after which it would have to be widened out to 5x6 ft. to admit using sublevel cars. Wheelbarrows could be used for narrow drifting, the raises being put 25 ft. apart if necessary. The 91-ft. level drifts would now be timbered under the 73-ft. level cave and the 79-ft. sublevel started south under the 73-ft. level cave as *LM* in elevation. The drifting south on this level would be with 4x5-ft. drifts, and only fast enough to keep in advance of the caving in this sublevel. Work here would be with wheelbarrows, the raises being put up at 25-ft. intervals.

If pushed for ore, caving could be started from *N* toward *K*. This would not be advisable unless necessary, and not unless there was a good back of taconite capping. Pillars would have to be left as shown in plan by 1234 in 91- and 73-ft. levels to protect timber shafts until no longer necessary. Possibly larger pillars would be necessary depending on the ground, but 40-ft. pillars would be ample. In like manner caving

One of the Largest on the Mesabi Range

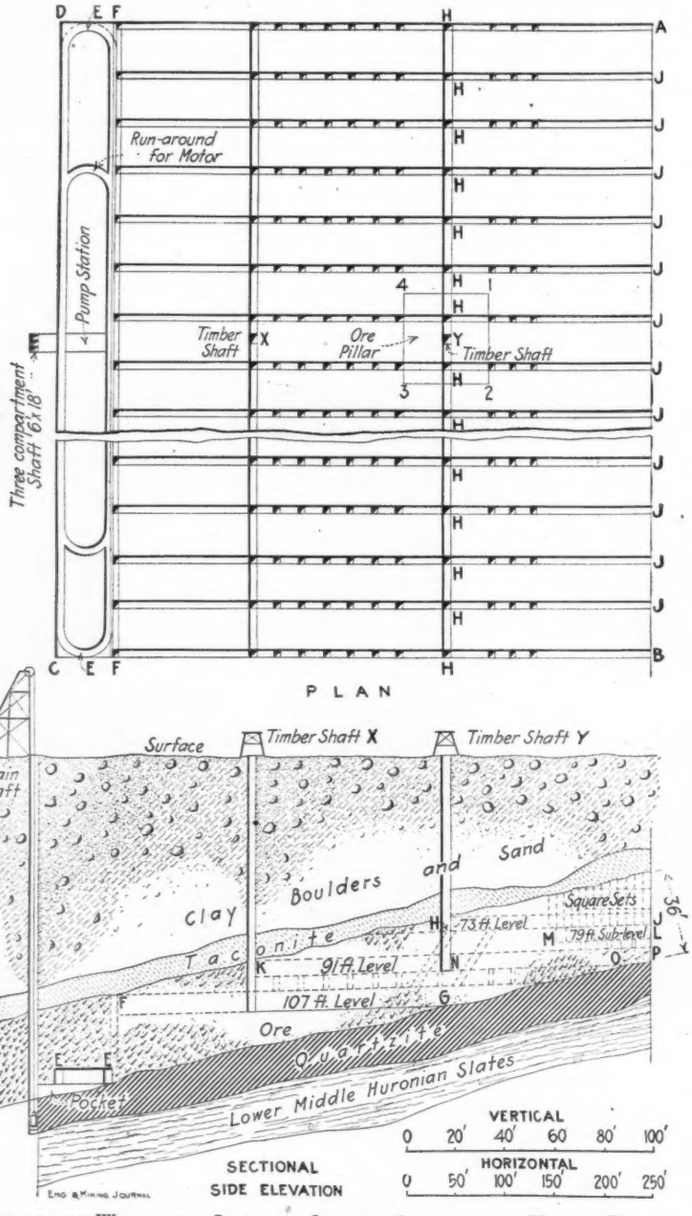
would be started in the 91-ft. level, retreating from *P* toward *O* as soon as the caving had been started in the 79-ft. sublevel.

The development without timber is rapidly gaining in favor as it not only hastens development, but materially aids production during development stage, which is the period of small hoists and therefore high costs. An ascending grade of from 0.5% to 1% for drifts should be allowed, as with car work it is impossible for them to be driven without this grade.

It might be well to point out that it is not possible to mine without timber, or better drift without timber, in all mines. Where this would be impossible timbering would not change the above laid out system in any respect. It might also be considered better practice to put timber shaft *X* down farther south on property as at *F* in elevation, and have the mainshaft pillar do for both the main shaft and timber shaft. If this were done *Y* would be continued down to the 107-ft. level, at the start. Timber shafts would be sunk through surface material and raised through ore, in order that ore hoisting be not impeded.

The south half of 40 acres would be mined in a similar manner. When a slice is worked out it is customary to lay boards on the floor and nail boards up on sides, to keep good ore and caved material separate when the worked-out slice is blasted in.

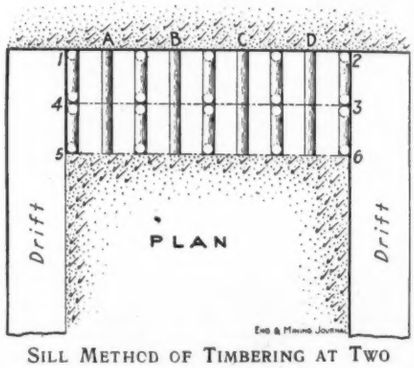
With this method it is claimed that a 99% extraction can be obtained, but 95% is probably nearer right. Ore is stockpiled in winter, end-dump cars being generally in use on the stock pile, and are handled by electric locomotives. Costs range from 60c. to $1 per ton, and there is at present a 60c. hauling charge from range points to the lake, and 60c. lake freight to the lower ports. Royalties range from 5c. to $1, late leases from 50c. to $1.



METHOD OF WORKING A SHALLOW SLOPING OREBODY ON MESABI RANGE

NEW METHODS AT CHISHOLM

A new method of timbering is in use at the Monroe and Elizabeth mines at Chisholm called by some the "sill" and by others the "three leg" method. In the accompanying engraving is given a sketch plan of two slices 8 ft. wide, from which ore has been removed, with timber standing. Posts are represented by small circles. Sills or caps as they will eventually be are placed in the bottom at *A, B, C,* etc., being sunk in ore level with the floor of the slice, and room 1265 blasted in. When the next slice below is started, the back of which is right up against the covering boards laid down in floor of 1265, the first slice starting under 1234 (now covered with caved material) has sills *A, B, C,* etc., already in place as caps, and the miners have only to put up posts under the cap. Not only is this so, but when slice under portion 1234 is cleaned up and the miners go under portion 3456 they only have to put in caps on the 56 side of the drift.



SILL METHOD OF TIMBERING AT TWO CHISHOLM MINES

This sounds good in theory, but practically it is often necessary to put the fourth post under sill or cap. The cost of sinking the sill and the fact that the slices must come exactly under the one above more than offset the cost of extra post and labor of putting up caps by the old method. Opinions differ as to the practicability of this method, but many think that it will not gain in favor.

Austrian Potash Salts

The Austrian potash deposits in Galicia, reports Consul General Charles Denby, of Vienna, are not yet developed to the point of manufacturing or exporting the salts. There is a small amount mined for local use, but petty jealousies between the Galician government, owning one field, and local capitalists, owning the other, have prevented large-scale development.

The Principles of Blende Roasting—I

Hearth area determines roasting capacity only in connection with the manner of stirring, of supplying air, and of firing. The principles of roasting, the avoidance and production of zinc sulphate, and of zinc ferrite are discussed by W. Hommel.

Note—Translated by O. H. Hahn, from an article by Dr. W. Hommel, in "Metallurgie," May 8, 1912.

The means which practical metallurgy uses for carrying out its various processes do not generally change much in the course of years. If new apparatus or new methods are introduced it takes considerable time before they attain general application; but if they are once adopted they are soon elevated to the rank of a prototype and their peculiarities are made fundamentals with which new ideas are compared and measured.

Hearth Area Does Not Determine Capacity

Such a fundamental principle is the "roasting area" or "hearth area" of a furnace, and frequently the attempt is made to determine the capacity of a new furnace construction by calculating the hearth area. Really hearth area considered by itself does not mean anything unless it is connected with a given type of furnace. By hearth area alone the capacity of a furnace is as little determined as is electric energy by merely the voltage. Besides the hearth area the following factors are decisive in determining the furnace capacity: (1) The manner of stirring or rabbling; (2) the manner of supplying air; (3) the manner of firing.

Many of present-day practitioners, if they talk of hearth area in blende roasting, evidently have in mind the conditions of a Hasenclever-Rhenania furnace. Just as evidently they apply the same conditions to other furnaces and by comparing the hearth areas endeavor to draw their conclusions in regard to the efficiency of the respective furnaces.

That this is wrong follows from the fact that in a Rhenania furnace 6.5 tons raw blende are roasted in two shifts in 24 hr., while with three shifts nine tons may be put through. The capacity of the furnace is, therefore, in this case approximately proportional to the working gang. Of course, this capacity has an upper limit which depends upon the construction of the furnace.

One man requires a certain time to work the blende through in the different stories. When a charge has been drawn the next one is shifted in its place and the balance of the content of the furnace is successively moved onward. To finish this work from five to six hours are ordinarily required, during which time each particle of ore travels one-tenth of the total way. Hence the ore requires from 50 to 60 hr. to pass through the whole furnace, which time is occasionally prolonged if a charge should have to remain longer in the furnace on account of being insufficiently roasted. This naturally retards the forward movement of the balance of the charges. The capacity of the furnace may then be raised by using a heavier bed of ore or by more vigorous rabbling of the ore.

In each case a large amount of labor will be required of the workman from which it follows that in a day of three shifts more work will be accomplished than in one of two because each workman has only a certain maximum amount of labor at his disposition. This accounts for the above results. The efficiency of the furnace can, with hearth area remaining the same, be increased by 50% by expending more labor; that is, by more vigorous rabbling. The analogous influence of air supply and of heat will be shown below.

Effect of Increased Rabbling

When I was about to build my first mechanical furnace an experienced metallurgist told me that in such a furnace blende could not possibly be roasted to a finish because it took over 60 hr. to do so, while the blende only remained a few hours in the mechanical furnace. As my counter arguments did not avail and as the views of the practical man based on years of experience had more weight with my principals there was nothing left but to demonstrate the correctness of my ideas by experiment.

For this purpose I caused a charge of 400 kg. to be kept strictly separate from the other ore in course of roasting, from the moment it was charged on the top floor of a Rhenania furnace to the time it left the furnace. This was attained by keeping a free space of a hand's breadth to the right and left of the charge on the hearth. Otherwise this charge was treated just exactly in the same manner as the balance of the ore; it was passed through the furnace in the same way without receiving any special attention.

Previous to each rabbling a sample was taken with great care and tested for sulphur; the same thing was done immediately after the rabbling. For the first tests, now and then, a grab sample was taken at random, but this method was soon discarded as giving irregular and unreliable results. Subsequently samples were taken from all over the charge, thoroughly mixed and an average taken from the mixture. Furthermore, a tally was kept of the time the ore was at rest and the time it was rabbled. Measurements of temperature were also intended, but could not be carried out on account of the poor condition of the pyrometer available. In this manner 11 tests were made on different blende ores. From the results obtained I will pick out two which represent extreme conditions, as blende *A* is a pure ore, which practically contains no other gangue than quartz and does not frit in the highest heat, while blende *B* contains lead and on that account easily clots.

Blende Roasts Only When Rabbled

During the total duration of roasting of 50 to 60 hr. there are actually only five hours spent in rabbling, which is barely one-tenth of this time. For the balance of it the ore lies dead in the furnace and scarcely roasts. Only at the surface of the charge exposed to the air a diminution of the sulphur takes place while the interior remains unaltered. This is especially the case with caking blende because the crust formed on it renders the access of air impossible. But I even found that noncaking granular blende will do the same thing. This is but natural, for the roasting of blende takes place in an entirely different manner from that of pyrites where the catalytic action of the iron oxide formed renders the progress of desulphurization in the interior of the ore particles possible.

With blende the oxidation is limited to the surface and is effected in the furnace altogether by the decrepitation of the crystals. On a charge of leady blende, which had remained quietly at rest on the second floor for 12 hr., a crust 1 cm. thick had formed. An analysis of it showed 4.4% sulphur, while the granular interior contained 14%, the same as 11 hr. previously. In this sense all the figures given in the tables below must be taken; they represent the average between the almost unaltered interior and better roasted surface. Some slight irregularities in the decrease of sulphur recorded are attributable to this fact, as even with the greatest care exercised in sampling occasional mistakes will slip in.

Summary of Roasting Results

Roasting blende *A*, on first floor in 28 hr. 50 min. it lost 23.3% of total S; on second floor in 17 hr. 10 min. it lost 34.5% of total S; on third floor in 10 hr. 5 min. it lost 39% of total *S*.

Roasting blende *B*, on first floor in 24 hr. 30 min., it lost 20.7% of total S; on second floor in 21 hr. 35 min. it lost 30% of total S; on third floor in 15 hr. 5 min., it lost 41.5% of total S.

Reducing the desulphurization to the time unit of one minute there was expelled per minute: From blende *A*, on first floor, 0.0140%; on second floor, 0.0344%; on third floor, 0.0644%. In roasting blende *B*, there were expelled per minute: On the first floor, 0.0141% S; second floor, 0.0232% S; on the third floor, 0.0461% S.

Hence the desulphurizing capacities of the individual muffles of the Hasenclever-Rhenania furnace correspond to the following ratios: With pure blende as

TABLE I—ROASTING BLENDE *A*

At rest		Time of rabbling		Percentage of sulphur	
Hr.	Min.	Hr.	Min.	before rabbling	after rabbling
		On Floor 1			
0	0	...	..	23.2	....
5	50	...	20	22.2	22.0
5	25	...	35	19.4	19.0
6	30	...	25	18.4	18.4
9	15	...	30	18.4	17.8
27	00	1	50	23.2	17.8
		On Floor 2			
5	05	...	20	17.0	14.0
11	20	...	25	12.4	9.8
16	25	0	45	17.0	9.8
		On Floor 3			
3	50	1	15	6.8	2.1
4	..	1	..	2.1	0.74
7	50	2	15	6.8	0.74
51	15	4	50	23.2	0.74

TABLE II—ROASTING BLENDE *B*

At rest		Time of rabbling		Percentage of sulphur	
Hr.	Min.	Hr.	Min.	before rabbling	after rabbling
		On Floor 1			
0	0	...	..	24.2	....
7	..	...	20	23.8	22.8
3	30	...	25	21.4	21.0
6	45	...	30	19.0	18.7
5	30	...	30	20.6	19.2
22	45	1	45	24.2	19.2
		On Floor 2			
6	..	...	15	18.6	16.8
7	45	...	15	15.2	14.6
7	05	...	15	13.2	12.0
20	50	0	45	18.6	12.0
		On Floor 3			
6	05	...	40	10.0	8.2
2	50	1	..	5.4	3.8
3	30	1	..	3.8	1.94
12	25	2	40	10.0	1.94
56	00	5	10	24.2	1.94

1: 2.4: 4.6; with caking blende as 1: 1.7: 3.3; or, on an average as 1: 2: 4.

On the lowest floor of a three-story furnace there are then four to five times as much sulphur removed as on the topmost one and twice as much as on the second, although the "hearth area" is the same on all three floors.

This result appears to be somewhat surprising, especially if one thinks of the proverbial saying common with zinc metallurgists: "It is so hard to remove the last few per cent. of sulphur." According to my view it is no more difficult to remove these last few per cent. than the rest, if the conditions requisite for a dead roast are provided.

Three Conditions for High Efficiency

What is the much higher efficiency of the lowest muffle based on? In the first place, of course, on the more vigorous rabbling of the ore. But this alone does not offer a sufficient explanation, for we see from Table I that the rabbling times in the three muffles (from top down) are as 3: 1: 4. Yet in the second muffle twice as much sulphur was expelled as in the first one; and in the third one, twice as much as in the second. The ratio of desulphurization from muffle to muffle is, then, constantly as 1: 2, while the ratio of rabbling in the first case is as 3: 1, and in the second case as 1: 4. As a second factor the temperature of the muffle plays an important part. The comparatively low temperature of the topmost muffle partially explains its low desulphurizing capacity. It must be considered, however, that a charge has already reached the ignition temperature of blende (500° C.) a few hours after charging, and so would roast just as well and fast as a charge in the third muffle, if it was afforded the third factor in an equal measure.

This third factor is the supply of air. At the lowest muffle only pure air enters; it reaches the second muffle, charged with SO_2, and gets into the top one charged still more with SO_2. It is only when the working doors are opened that the upper muffles receive pure air. The well known formation of heavy clouds of SO_2 indicate an immediate increase of desulphurization. With the doors closed it is only the air coming from the lower muffles which gets into contact with the ore, and as this air is much rarified in regard to oxygen, desulphurization can only proceed slowly.

In further proof of the influence of these factors I made the following experiments into the lowest muffle: 280 kg. raw blende were charged and distributed over two working doors. As soon as the ore was heated up two men began to rabble it vigorously without intermission. When the men were tired two others immediately relieved them. At regular intervals samples were taken of the charge. Sulphurous acid was given off in thick clouds. The sudden disappearance of these clouds indicated that desulphurization had been completed. The result was the following: Content of the raw blende, 19.2% S; content after one hour's rabbling, 8.2%; content after two hours' rabbling, 3.56%; content after 2½ hours' rabbling, 2.04% S.

At this point the experiment was broken off as the muffle began to cool off rapidly owing to the excess of air rushing in. The experiment was twice repeated with the same result. Hence it was clearly proved that blende may be roasted to a finish in 2½ hours.

Conditions in the Hasenclever-Rhenania Furnaces

The Hasenclever-Rhenania furnaces cannot be said to fulfill the conditions for a rational roasting of blende. But it is obvious that, if the three other factors beside the hearth area could be equalized in all three muffles, their desulphurizing power would become the same, or, in other words, the capacity of the whole furnace would be multiplied. This is, however, an impossibility with these furnaces. In the first place, the working gang cannot be increased without the men interfering with each other in rabbling. Even if this were possible, a simultaneous working at the different muffles is impracticable as the hot gases coming from the lower muffles would be repelled by the cold air entering the upper muffles owing to the manner of admitting the air. Furthermore, continuous work in the lowest muffle is prohibited by the impossibility of preventing the entrance of an excess of air during rabbling by which the muffle would be rapidly cooled as soon as the percentage of sulphur in the blende falls below a certain limit.

I have not made mention as yet of the bogy of roasting plants, a bogy which preferentially hovers about metallurgical laboratories; that is: The formation of zinc sulphate and the alleged difficulty of its decomposition. Such a difficulty does not exist in a well conducted roasting establishment, for always supposing that the roasting process is properly conducted—a noteworthy formation of sulphate does not take place, or rather, the sulphate that may be formed never reaches the lowest muffle, but is decomposed previously. If such cases happen as Mostowitch mentions[1], in which a vendor of roasted blende had to stand a deduction from the agreed selling price on account of the sulphate content of the roasted blende, he should in his turn make a deduction from the wages of the roaster and there would soon be no more complaint.

Zinc Sulphate Not Difficult to Decompose

The zinc sulphate decomposes with the greatest ease as every one who has occasion to produce as much as possible for some purpose or other, will testify to. Even H. O. Hofman in his classic research on the decomposition of zinc sulphate has not succeeded, in roasting blende, in retaining more than a few per cent. of sulphate in the roast, and therefore felt justified in propounding a somewhat venturesome hypothesis to explain the method of leaching zinc at the lower Harz. He says in part: "Probably the sulphates (in fine *schlich*) are formed in this way, that the zinc sulphate which was produced in the interior of the roast

[1]Metallurgie, 1911, p. 763. cf. Eng. and Min. Journ., Mar. 16, 1912.

heap is decomposed again and that the rising products of decomposition SO_3, SO_2 and O attack the fine *schlich* on the outside causing the formation of normal and basic salts or solely basic salts which are then partially decomposed again as the heat in the heap spreads."

But Hofman in his investigation has overlooked one point; that is, he had, in all his experiments in the sulphate roasting of blende, exceeded the temperature of decomposition of the zinc sulphate from the start. The lowest temperature at which he roasted was 650° C.; that is, this was the external temperature perceptible at the pyrometer, which was the sum of the external heat plus the heat of combustion of the zinc sulphide. This heat of combustion gave rise to a locally higher temperature, which decomposed the nascent zinc sulphate as fast as it was produced.

Possibility of Sulphate Roasting

It is quite possible to obtain 60 or even 70% of the zinc in a blende as sulphate, especially if the latter carries iron, only the furnace temperature in roasting must not exceed 600° C. In order to attain this end, the external heat must be restricted as much as possible, the muffle should even be cooled down if it is desired to accelerate the process by an increased draft and livelier rabbling. In this manner I have treated zinc-lead ores high in iron (25% Fe) from Tasmania, in the reverberatory as well as in a Hasenclever-Rhenania furnace, and obtained roasted product which, when plunged in water after cooling, would raise its temperature to the boiling point.

In heap roasting the facts are just the reverse from what Hofman states them to be. The reactions in the interior of the heap rather resemble those met with in pyritic smelting. One part of the pyrite sulphur distills off and matte is formed. Only in the outside strata which are more accessible to air, a slow roasting with formation of sulphate takes place. The formation of matte in the core is just the reason for the necessity of the several successive roastings extending over a period of many months.

At which temperature does zinc sulphate decompose, then, in the roasting furnace? Of the numerous experiments which have been carried out those of W. S. Landis[2] appear to me as best meeting practical conditions. Landis gives the temperature of decomposition in the normal air current as 760° C. The first indications of decomposition became perceptible at 730° C. and at 760° C., all $ZnSO_4$ was completely and quickly decomposed. Doeltz and Graumann[3] also seem to have worked with ordinary air, hence air containing aqueous vapor, and their experiments agree pretty well with those of Landis, although, as may be inferred from their brief account, they worked in such a slow current of air that even at a high temperature (880° C.) the conditions for an equilibrium system $ZnO — SO_2 — O \rightleftarrows ZnSO_4$ could still exist. At any rate they showed that in heating to 800° C. practically all the zinc sulphate is rapidly decomposed. Hofman also worked apparently with a slow current of dry, pure air. His observations on the influence of the thickness of the charge on the time and temperature of decomposition are of great practical interest. He found that for complete decomposition at 836° C. 26 hr. were required if the charge was 5 mm. thick, while 12 hr. sufficed at a thickness of 2 mm., eight hours for a thickness of 0.5 mm. and 803° C., and 12 hr. at the same thickness and 770° Centigrade.

These are conditions which are still more plainly to be noticed in practice; they show how necessary it is to bring each particle of zinc sulphate in contact with air, and air in motion, too, which is capable of quickly removing the dissociation products. As long as the ore is piled up in a heap the decomposition of zinc sulphate progresses extremely slowly. In the interior of the heap conditions of equilibrium undeniably obtain as they were investigated by Wöhler and Plüddemann[4] for the system $ZnO — SO_3 — SO_2 — O \rightleftarrows ZnSO_4$, they were only disturbed when the heap was vigorously and thoroughly stirred.

These researches of Wöhler and Plüddemann have been incorrectly quoted by Thomas[5] in comparison with his own results from which he deduces the fallacy that he succeeded in decomposing zinc sulphate by using steam and carburetted hydrogen at a temperature nearly 100° lower. In fact, Thomas has shown nothing else than that the sulphate by his method—which, by the way, is worthless in actual practice for economical as well as technical reasons—decomposes at a temperature nearly 100° higher than in common roasting practice. Besides, his method takes so much longer. Mostowitsch[6] finds that zinc sulphate decomposes completely when heated up to 850° for one hour, and asserts that at 750° the decomposition proceeds 17 times slower. For the experimental conditions applied by him this may be undoubtedly correct, but the result must under no circumstances be referred to practical conditions.

Experimenters Do Not Follow Practical Conditions

Mostowitsch, and Hofman as well, and in a minor degree Doeltz and Graumann experimented under conditions exactly opposite to actual roasting practice. None of these experimenters had provided for a brisk draft as it is to be found in any good roasting furnace. Hofman and Mostowitsch even worked under pressure, a condition not to be thought of in actual practice, and although the above mentioned experiments of Hofman on the influence of the thickness of the charge clearly indicate the way to be taken, neither of them drew the logical conclusion that the material should be rabbled.

In the course of decomposition of the zinc sulphate, bubble-like coatings of gas particles are formed on the ore, which adhere strongly to them in consequence of surface tension. On this is based the well known phenomenon of the "running" of the blende in the furnace, the individual particles being disposed to dislodge one another. Only by energetic rabbling can these gas spaces be removed. I, therefore, take the view that results, useful in actual practice, can be obtained only when the experiments are carried out in a strong air current and by stirring the material.

Air Supply to Roasters Should Be Hot

For the first condition it would be necessary to use hot air to prevent the chilling of the material. Up to here I consider the experiments made by Landis, who conducts the air over the zinc sulphate by suction and thus creates a feeble vacuum over it, as decisive for practical conditions, particularly since I know that it is quite possible to prepare blende free from sulphate even if the furnace temperature does not exceed 800° C. The temperature of the furnace is usually rated much too high and the necessity of excessive heat on the lowest hearth of the Hasenclever furnace based upon a faulty air supply has given rise to the legend of the difficult decomposition of zinc sulphate.

I say "faulty" air supply, for it is obvious that under present conditions, as soon as the working doors are opened, a large excess of cold air rushes over the ore which, in consequence of an insufficiency of sulphur content, cannot protect itself from getting chilled. In order, then, to obtain the temperature necessary for the decomposition of zinc sulphate the ore should be overheated beforehand. Lessening the draft, perhaps, by inserting a special damper, does not do any good, for a strong current of air is absolutely required. What is the moral then? Heat the air before it enters the lowest muffle.

We now see the importance of a correct air supply and of the manner of heating. If it were not for these shortcomings in the Hasenclever furnace, which cause interruptions in the working of the charge, the desulphurizing capacity of the lowest muffle might be raised to three or four times its present desulphurizing capacity, so that it would have

[2]Met. and Chem. Eng., Jan., 1910, p. 22.
[3]Metallurgie, 1906, p. 445.
[4]Ber. d. Deutsch. chem. Ges., 1908, I, 703.
[5]Metallurgie, 1910, p. 610.
[6]Metallurgie, 1911, p. 767.

12 times the desulphurizing capacity of the top muffle.

Faulty temperature makes itself known, too, in another way, by the formation of matte and ferrite in the roast. The former occurs when impure blende is left at rest, i.e., without rabbling, for any length of time on the second floor under a high heat and with insufficient draft. In this case a part of the pyrite sulphur (for all impure blende contains some pyrite) distills off and the remaining iron sulphide sinters together with the finest particles of decrepitated blende. It is mainly this agglomerate which renders roasting in the lowest muffle so difficult, especially when, owing to the presence of lead, lead matte is formed. But the blame is always laid on the zinc sulphate when there is any difficulty encountered in roasting. That zinc-iron sulphide remains in the roast to the last has been established already by Jensch.[7]

Zinc Ferrite Due to Faulty Working

Another undesirable case occurs when blende heavy in iron is strongly heated from the outside and briskly worked without a considerable excess of air. It may then happen that the whole of the iron present will combine with zinc forming zinc ferrite. In this way I succeeded, although against my intention, in rendering insoluble in sulphurous acid, 50 to 60% of the zinc content in a Tasmanian ore. The ore in question contained 30% Zn, 18% Fe and 10% Pb, and was roasted in a Hasenclever furnace under the above conditions.

It is noteworthy that after the largest portion of the sulphur had been removed at the lowest possible temperature, the ore could be exposed to the highest heat obtainable in a roasting furnace without any ferrite being formed. Since the ore represents such an intimate mixture of zinc, iron and lead that these ingredients cannot be separated mechanically even when crushed to the finest state all conditions would be eminently favorably for a formation of ferrite. That it does not take place, nevertheless, proves conclusively that the temperature of formation of the ferrite lies considerably higher than 700 or 750° C., as Mostowitsch[8] assumes. Indeed, it must lie considerably higher than 900° C., as Graumann[9] rightly anticipated.

Mostowitsch wants to explain the influence of ferric oxide on the decomposition of zinc sulphate by the formation of ferrite, and quotes a statement of Kohmeyer,[10] who refers to the appearance of magnetism at 700° C., alleged to have been observed by Hilpert,[11] as a criterion for the temperature of formation. But Kohlmeyer quotes wrongly because Hilpert's statement does not refer to zinc ferrite at all but to lead ferrite! Accordingly Mostowitsch's conclusion falls flat and we may be glad that this is so, for else a rational reduction of blende would not be possible as there would always be large quantities of ferrite forming in the roasting furnace when a large percentage of iron is present.

Conditions for Ferrite Formation

Formation of ferrite only then takes place in the roasting furnace when blende is heated excessively from the outside and when sulphur burns up under conditions favorable for the generation of a maximum of heat. In this case the temperature requisite for the formation of ferrite will always be locally produced. That this temperature lies above 1200° C. seems to follow from the experience had in zinc smelteries that, if well roasted ferruginous blende is distilled at too high a temperature great losses will result in consequence of ferrite formation in the muffle. In smelting Australian zinc concentrates at Seaton-Carew the observation was made that at too high a furnace temperature, over 20% more was lost of the total zinc than under normal conditions. The cause was the formation of a heavy solid crust on the charge containing zinc as ferrite from which it could not be recovered even by raising the temperature to the highest attainable limit. If the temperature was kept moderate from the start and was only raised gradually no ferrite was formed and the loss in zinc remained normal.

The admonitions of Lindt[12] have to be supplemented in this, that the zinc smelter will have to direct his attention not only to the zinc ferrite formed in the roasting furnace, but also to that formed eventually in the muffle. The attempt to decompose zinc ferrite by application of higher heat is futile. Only prevention can do good; after-treatment does not avail; it only increases expenses.

From the above we see that a faulty supply of heat can consist in a maximum as well as in a minimum. The same holds good in the supply of air. In regard to the latter there is one point of the utmost importance, to wit—the height of the muffle. If we draw a horizontal line indicating the height of the ore charge through a cross-section of the muffle, an ideal proportion will be when this line cuts the section into halves. The less of the total space the ore occupies in the muffle the worse will be the proportion because the utilization of the air and, therefore, the percentage of the roasting gases in SO_2, will be less. Only in the last muffle the proportion must be changed in favor of a considerable excess of air for reasons already discussed at some length. In the Hasenclever furnace there is this special drawback, that the last third or quarter of the lowest muffle, i.e., the space between the last two working doors, is totally unfit for a successful finishing roast. Here the air never sweeps completely over the spread-out charge, besides only cold air brushes against the ore whereby it is rapidly cooled and can only be worked for a short time. It is, therefore, advantageous not to move the ore to this place at all, but to do the finishing work from the two previous doors. The space behind the last two doors may then be filled with pieces of firebrick and the air may be admitted through special openings in the end of the muffle, so that it sweeps over the hot firebrick and comes hot in contact with the charge to be finished.

From the above it becomes evident that a good blende-roasting furnace must be so constructed that it will fulfill the following conditions: (1) The ore must be quickly brought to the temperature of ignition which is produced by external heat or by the hot roast gases; (2) the ignited blende must be deprived of most of its sulphur by vigorous rabbling and moderate draft, but without external heat; (3) the almost desulphurized blende must be brought in contact, at a temperature not exceeding 800° C., and lively stirring, with a heavy current of air without getting chilled; (4) the space occupied by the ore must be to the free space of the muffle as 1 : 1, or as near this proportion as possible.

(To be concluded)

[7] Zeit. f. angew. Chemie, 1894, p. 50.
[8] Metallurgie, 1911, p. 772.
[9] Metallurgie, 1907, p. 70.
[10] Metallurgie, 1910, p. 292.
[11] Ber. d. Deutsch. chem. Ges. 1909, p. 2251.
[12] "Metallurgie," 1909, p. 746.

Spanish Metal Exports

Exports of metals and minerals from Spain, seven months ended July 31, as reported by *Revista Minera*, in metric tons, were:

Metals	1911	1912	Changes	
Pig and manuf. iron	27,526	26,137	D.	1,389
Copper	8,924	13,484	I.	4,560
Copper precipitate	9,301	8,511	D.	790
Lead	93,972	109,883	I.	15,911
Zinc	1,158	1,366	I.	208
Quicksilver	1,480	1,476	D.	4
Minerals				
Iron ore	4,671,897	4,926,584	I.	254,687
Manganese ore	20,912	19,936	D.	976
Copper ore	206,769	85,899	D.	120,870
Lead ore	1,837	2,086	I.	249
Zinc ore	84,279	68,931	D.	15,348
Pyrites	1,555,859	1,709,599	I.	153,740
Salt	342,220	403,171	I.	60,951

Pyritic ores are now classed as pyrites unless they carry 2.5% or over in copper. Last year the dividing line was 1% copper.

Sale of Nitrate Lands

The government of Chile has announced an auction sale of nitrate lands, to take place in Santiago, Chile, on Dec. 2, 1912. Full details may be had on application at the Chilean Legation in Washington, or the Chilean Consulate in New York.

The Mexican Mill, Virginia City, Nev.

By Whitman Symmes*

At the Mexican mill on the Comstock Lode the ore is all-slimed and cyanided without preliminary amalgamation or concentration; an extraction of from 93 to 95½% is obtained. Gelatinous clay in the ore made impossible a clear overflow from Dorr thickeners. A new method of precipitating with zinc dust is employed.

*Superintendent, United Comstock Pumping Association; superintendent, Mexican Mining Co., etc., Virginia City, Nev.

The orebody now being worked in the Mexican mine lies in the hanging wall of the Comstock lode. On the 2500 level the ore has well defined clay walls, and occurs as a breccia of mineralized quartz, cemented by clay and some sulphides. Above that level it divides into forks and bunches, where the shearage which formed it, coming up from the main Comstock vein matter, dissipated its movement among a multitude of minor fractures of the hanging wall. The main, and richer portion of the orebody, between the 2400 and 2500 levels, was easily followed without special sampling, and part of it, averaging about $80 per ton, has been stoped and shipped to a smeltery. The water has not been reduced below the 2500 level since 1884.

THE MEXICAN MILL, VIRGINIA CITY, NEV.

All the ore now being mined must be sampled, round by round, before being broken. However, a face may sample $50 and the round broken may sample $2; or behind a face sampling $2 may be found a bunch or a knot of quartz stringers of sufficient value to make the round broken sample $50.

ORE SUPPLY ERRATIC

On account of the limited size of the orebody above the present water level, and its uneven tenor, it has not as yet been found possible to supply the mill with ore of the same character or value, day by day. The ore sent to the mill consists of hard quartz, crushed quartz with clay, quartz stringers in hard diorite, quartz stringers in hard diabase, and quartz stringers in decomposed diabase. In spite of our best efforts, the head samples will some days average $15, and on other days $40. Sometimes the stamps will be crushing hard quartz or diorite at the rate of 60 tons per day, and at times they will be crushing soft clayey ore at the rate of 125 tons per day. These irregularities, which we have not yet been able to overcome, require constant attention, and militate against our obtaining the best results in milling and cyaniding.

A composite sample of ore from the main deposit between the 2400 and 2500 levels, analyzed as follows: Silica, 80.56%; lead, 1.57; zinc, 1.60; copper, 0.78; sulphur, 2.17; aluminum oxide, 5.92; ferric oxide, 3.78; calcium oxide, 1.05; magnesium oxide, 2.21; moisture, 0.36; gold, about 2.5 oz. per ton; silver, about 50 oz. per ton. The value of the ore averages about two-thirds in gold, and one-third in silver. In one part of the mine, 50% of the value is in silver, and in the smaller irregularities of the deposit the gold is in excess of the average. The silver occurs as sulphide. Gold is rarely visible in the ore, but the gold occurs free, and intimately associated with the lead and zinc sulphides. Stephanite is supposed to be one of the common silver minerals of the Comstock, but no antimony has been found by analysis, although the strongly reducing action of the ore in the cyanide tanks, and the difficulty of obtaining good precipitation, is constantly suggestive of it.

In order to devise the proper method of mill treatment, five lots of ore, from different portions of the deposit, were separately tested at the works of the

California Ore Testing Co., in San Francisco. Tests of composite samples of the ore were also made. The work was ably directed by Abbot A. Hanks, manager of the above works, according to plans agreed upon with me from time to time. The tests comprised various combinations of crushing to different degrees of fineness, with amalgamation, concentration and cyaniding. Concentration was made upon both vanners and tables. In all methods of extraction tried, the finer the grinding the better were the results. When tube milling so that 96.5% passed a 200-mesh screen, 58 to 76% of the gold, and 8 to 33% of the silver were obtained as amalgam, and by amalgamation and concentration 82 to 89% of the gold and 66 to 69% of the silver were obtained. By further cyaniding the tailings, the total extraction was 87 to 97% of the gold and up to 94.6% of the silver. By prolonged treatment and exact work, the gold in the tails was reduced to 0.01 or 0.02 oz., and the silver to about two ounces.

Further tests were then made by tube milling and cyaniding without either amalgamation or concentration, and much to our surprise, this method promised the best results. When crushing so that 92% passed a 200-mesh screen, we obtained as low tails as by the other methods, and the cyanide consumed did not appear to be greater than when cyaniding the pulp after concentration. The cyanidation of a richer pulp, containing base sulphides, which would in time foul the solutions and lower their power of extraction, seemed warranted by the avoidance of concentration, with its accompanying costs for plant, treatment, freights and smelter deductions.

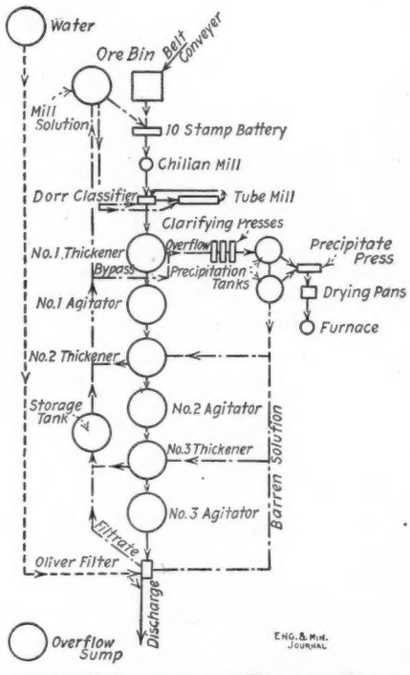
Ore Crushed at Union Shaft

The ore is crushed at the Union shaft, which is 630 ft. from the mill bin, in a No. 3 McCully crusher. No grizzly is used, and the crushed ore falls on a 14-in. Robins belt conveyor, 321 ft. long. This delivers it to a 10x12-in. iron-lined chute, resting on the old waste-dump at an angle of 36°, and delivering into a storage bin, built into an excavation in the dump. From this bin a second 14-in. Robins conveyor, 188 ft. long, carries it to the mill bin. The ore is fed from bin to belt by a short 22-in. belt conveyor placed beneath the chute, and the lower conveyor is run only at such times as it is desired to fill the mill bin. These bins have flat bottoms, and capacities, without resorting to shoveling, of 70 and 150 tons, respectively. An 8x12-in. jaw crusher is installed on the first bin for crushing ore from open storage piles, at the side of the old dump, and ore can thus also be crushed and sent from mine to mill by rail in case of a breakdown of the gyratory crusher, or of either of the belt conveyors.

One man attends to the upper belt conveyor and the gyratory crusher on the afternoon shift, when most of the ore is hoisted. Ore hoisted on the other shifts is put through the crusher by the top carman of the Union shaft. Each car is weighed on a platform scale in the crusher house and under present conditions the installation of an automatic weighing machine would not pay for itself. The head samples are taken by hand by making cuts with a broad shovel through the stream of ore at the end of the lower belt conveyor, while filling the mill bin. Sampling of the battery feed was at first tried, but on account of the difficulties of obtaining an even mixture of the ore at that point, the assay results were too low.

Mill Machinery

The mill was first designed for a capacity of 70 tons per day. This was changed



Flow Sheet of the Mexican Mill

by increasing the weight of the stamps and leaving space for the installation, when desired, of a second tube mill, in the belief that the capacity could thus be increased to between 90 and 100 tons.

As at present constructed, the mill contains 10 stamps of 1250 lb. each, one Goldfield type chilean mill, one 5x18-ft. tube mill, one duplex Dorr classifier, three 14x24-ft. Trent agitators, three Dorr thickeners, (14x24 ft. and 14x26 ft.) one 11½x16-ft. Oliver filter, with vacuum pump, one 10x10-in. compressor for filter and air lifts, three clarifying presses, and two 6x20-ft. precipitation tanks. On the cleanup floor are a 5x7½-ft. steam pan, a filter press for the precipitate, a No. 525 Steele-Harvey furnace with blower, and a 40-hp. locomotive boiler for heating the mill and the solutions. Outside the mill building are four tanks for water and solution storage.

The Ore Is all Slimed

In the Mexican Mill cyanidation is continuous, and the flow sheet is simple. In order to cyanide $25 or $30 ore instead of $5 or $6 tailings, as would be done in a plant employing concentrators, greater dissolving power must be provided, and the dissolving power of the solutions must be maintained as high as possible by precipitation and other means. These conditions are found to be of the greatest importance in cyaniding the Mexican ore, on account of the base sulphides present, and their effect in lowering the extractive value of the solutions.

From the stamps the pulp passes to the chilean mill, without classification and thence it goes to a Dorr classifier. The sands are fed to a tube mill, and the tube-mill product is returned to the classifier. The slimes from the classifier flow to the cyanide department.

The pulp from the classifier, having a ratio of about eight of water to one of dry slime, flows into No. 1 Dorr thickener, where it is thickened to a ratio of 2:1. Thence it is delivered to No. 1 agitator, where it meets a stream of barren solution which dilutes it, on entering, to 4 or 5:1. It is then thickened to 2:1, and delivered to No. 2 agitator. The pulp from the latter is similarly diluted to 4 or 5:1, and thickened again in No. 3 thickener, from which it passes to No. 3 agitator and thence to the Oliver filters. In the latter it is further diluted and washed with barren solution, and is then washed with water.

The solution from the No. 1 thickener, having the greatest value, is pumped through the clarifying presses into the precipitation tanks. The overflow from No. 2 and No. 3 thickeners, and the filtrate from the Oliver are pumped up to the main storage tank to be used in the milling department. The barren solution from the precipitation tanks is used for diluting the pulp as it goes into the No. 2 and No. 3 thickeners, and for diluting and washing in the Oliver filter.

Design Adapted to Mill Site

Slime is moved by a rubber belt-and-bucket elevator, which takes the tube-mill product back to the classifier, and by air lifts between the thickeners and agitators. Since the agitation is in tanks of the same height as the thickeners, the transfer from the thickener to agitator and from the agitator to thickener is easily carried out in the Mexican mill, and is the justification for the installation of flat-bottom agitators, instead of Pachucas. To have used Pachucas would have necessitated either carrying the thickeners on a high timber support, and separating the cyanide department from the mill, in or-

der to obtain the proper elevations, or else doing an immensely increased amount of excavation, with construction of high retaining walls, for which the mill site was not well adapted.

The installation of 20 stamps feeding direct to the tube mills is an attractive alternative design, but stage crushing with 10 stamps and one chilean appears to have justified itself in the lower cost of renewals and the smaller amount of power consumed by the chilean. When crushing 80 tons per day so that 86% passes 200 mesh, the power consumed is as follows: Stamps, 32.1 e.hp.; chilean, 19.8; tube mill, 58.7; total, 110.6 e.hp. (102 b.hp.) or 1.45 e.hp. (1.27 b.hp.) per ton of ore milled.

Selection of Filter

An equivalent Butters filter would not only have cost more than twice that of the Oliver, but in addition we would have had to provide the necessary storage tanks and pumps with increased excavation, and a larger mill building. It would have required the employment of one more man on each shift, and taking into consideration the comparatively small capacity of the mill, this extra cost did not appear to be justified. The weak point of the Oliver filter is its inability to obtain a good wash, and therefore its inability to remove sufficient of the dissolved gold-silver content of the pulp, except when the solution in the pulp going to it is of low value. The late John B. Fleming told me that he took this feature of the Oliver as his starting point in the design of the Nevada Hills mill, and provided as much displacement is possible of the richer solutions by poorer ones, before sending the pulp to the Oliver filter. The system of displacement by dilution and thickening, described above, we believe to be essential to the continuous cyanidation of the Mexican ore, and is not used merely for the purpose of sending solutions of low value to the Oliver. But it leaves the solutions of such low value that some one of the filters that give a better wash is not necessary.

The stamps are driven by a 40-hp. Westinghouse back-geared motor. The chilean and tube mills are driven by silent-chain drives. The centrifugal pumps are driven by either silent chains or by direct motor connections, and except on the lower floor, at the Oliver filter, there are no countershafts worth mentioning in the entire mill.

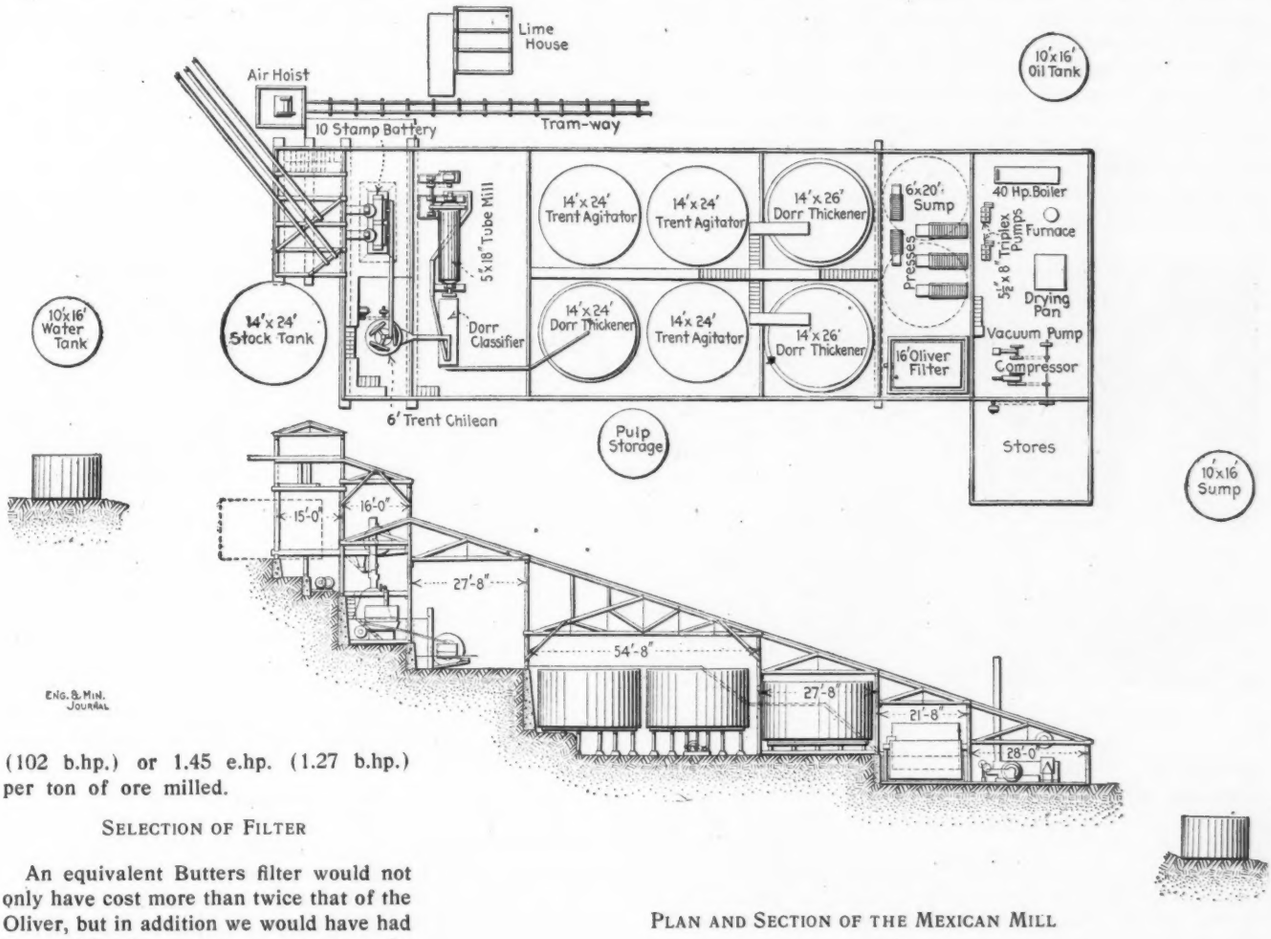
On the afternoon and night shifts only two men are in the mill, one in the crushing department and one in the cyanide department. On the day shift there are employed, in addition, a mechanic, one man sampling and testing, and three men for general work, such as attending to clarifying presses, taking head samples, caring for the lower belt conveyor, handling supplies and assisting at the cleanup. Additional mechanics are also employed from time to time to make such changes in the mill as are found necessary for its improvement.

Finer Grinding Will be Inaugurated

The feed to the stamps is split, to better distribute the ore. The stamps are now dropping 6 to 6½ in., 104 times per minute, the outside stamps being given the shorter drop. The screens used are 4 mesh and the battery product contains 4 to 7% of material that will pass 200 mesh.

The pulp is fed to the chilean mill without classification. Most of the screens are "ton cap," 24 mesh (opening 0.018 in.). The flow through the chilean mill is regulated by using one or two screens of finer or coarser mesh, as required, and also by adjustment of coarse inside screens, which blind the discharge. About 43% of the chilean-mill product will pass 200 mesh.

The overflow from the Dorr classifier contains between 84% and 91% of 200-mesh material. We intend to grind finer in the near future. The tube-mill feed contains 17% of 200-mesh material, and 51% of the product will pass 200 mesh. Hard cast-iron ribbed liners, of our own design of local make, are in use, and have given excellent satisfaction. With these liners the speed of 26 r.p.m. appears to be ample. Contrary to the ex-



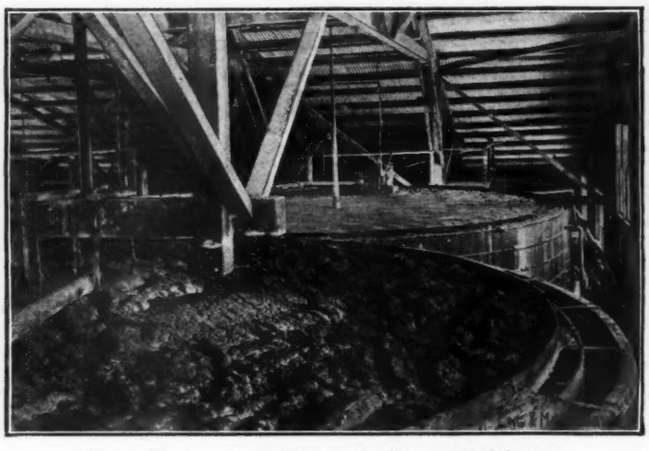
Plan and Section of the Mexican Mill

perience of others, we seem to obtain best results with a pulp containing 42% of moisture. The tube-mill product is returned to the Dorr classifier. Lime in solution is added at the classifier, and solid lime is also suspended in No. 2 agitator.

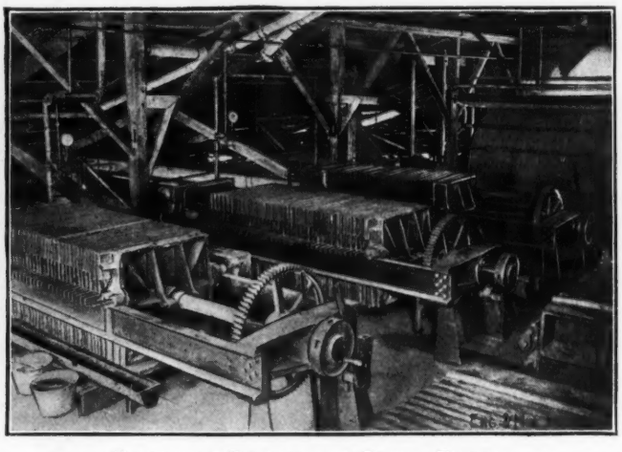
Dorr Thickeners Used

During the first few months of operation we encountered many difficulties, and one of the worst of these that we had to contend with, was the impossibility of obtaining a clear overflow from the Dorr thickeners. All possible proportions of lime were experimented with, without result.

The ore contains a small amount of gelatinous clay, which holds the air bubbles like a rubber sponge, and makes the clay float upon the surface of the thickeners. It crowds into the overflow launders, and soon chokes up the clarifying presses, where filtration ceases when the cake is ¼ in. thick and under 20-lb. pressure. The material shown in one of the illustrations is not foam, but contains above 40% of solids. We built a ring inside the circle of the launders, to hold some of it back, and tried sprays, without adequate result. Finally we decided greatly to increase our clarifying capacity, and take care of it in that way. It was not till the additional clarifying presses were installed that we were able to handle a fair tonnage or to average better than 90% extraction.



Dorr Thickener—Floating Slime 40% Solids



Clarifying Presses and Oliver Filter

Agitators Give Trouble

We have had considerable trouble with the Trent agitators, the total time lost in operation of the mill being greater on their account than from all other causes put together. The same machines appear to behave well in the Tonopah Extension mill, which was the reason for our selecting them, but they are there used for intermittent and not for continuous work. In our mill if anything goes wrong with an agitator, the entire mill must be stopped for nearly a day or else the passage of the pulp through the mill must be unduly accelerated. In a foreign advertisement of the Trent agitator, it is stated that, "Cyaniding, formerly a complex nightmare, becomes a delightful experience." But in our climate the action seemed to be different. The nozzles are easily stopped up. A few small slivers of wood will soon bring the agitators to a standstill. At first we heated them by means of 2-in. steam pipes, as used in the mill of the Tonopah Mining Co., and kindly sketched for us by its superintendent, A. R. Parsons. But a cake of mud formed on the pipes, and if a little of it got knocked loose, it would choke the nozzles and stop the agitators. The nozzles cannot be blown out with compressed air because nearly all the air will boil up in the center of the tank, coming out through the central sleeve. We installed a slime pump for emptying the agitators, and when doing so, of course, we had to accelerate the cyanidation. The installation of an extra agitator would unduly complicate the pipe connections. By additional agitating devices in No. 3 agitator, we reduced the undissolved gold and silver by 30c. At present we are changing the agitators so as to obtain a stronger agitation, and so as to allow the parts to be removed for repairs without emptying the tank.

We have tried to retard the flow of the sulphides through the agitators as much as possible. It required considerable experimenting to obtain the proper point above the bottom of the tank at which to withdraw the pulp. If it was taken off too low down the sulphides were shunted through to the Oliver at a very expensive speed; and if the point was too high up, concentrates were built up on the bottom of the tank until they stopped the agitators. The proper point varies, of course, with an alteration in the thickness of the pulp.

Operation of Oliver Filter

It took us a long time to obtain good results from the Oliver filter, and at first the dissolved gold and silver lost in the cake was from 40c. to 50c. per ton. We are now washing with 50 sprays, in addition to three perforated pipes, and are going to add more sprays. The sprays and pipes on the ascending side of the drum deliver barren solution, and those on the descending side deliver water. A large excess of barren solution is used, which runs down into the filter tank and dilutes the pulp from 2:1 up to about 4:1. With the two perforated pipes specified by the manufacturer for supplying the wash, the latter was unevenly distributed, the cake cracked badly, and nearly all the wash was drawn through the cracks. We cut down the side of the steel tank and placed sprays right down to the level of the pulp. We also added a second vacuum chamber, with a valve to suit, and we try to maintain a light suction on the portion of the drum immersed in the pulp, and a heavy suction on the portion that is being washed. Mr. Oliver states that he formerly supplied two separate suctions upon his filter for the purpose of keeping the cyanide solution and the wash solution separate, but that he discontinued doing so because nobody seemed to make use of the arrangement. Our double suction, however, does not separate the two grades of solution, but is for the purpose of decreasing the thickness of the cake while maintaining a maximum suction on the wash. The dissolved gold and silver lost in the cake now amount to only 8 to 10c. per ton, and often less. The discharged cake is washed away by a stream of water.

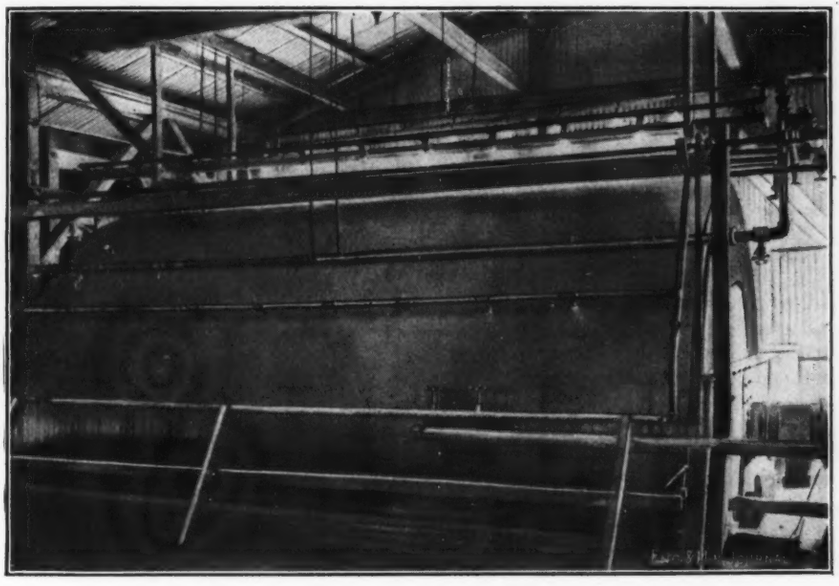
New Dust Precipitation Method

The clarified solution falls into the two 6x20-ft. sump tanks. These have filter bottoms built into them, upon which a layer of zinc dust is formed by hand. The solution to be precipitated is sucked through the zinc dust by a 5x8-in. triplex pump, which delivers it into the barren-solution pipe line. When the zinc dust in one tank shows signs of exhaustion, a fresh layer of zinc is charged into the other tank and the first tank is exhausted

and cleaned up. The precipitate is stirred up and pumped by a piston pump into a small filter press, whence it is dropped into the steam dry pan. We have tried the ordinary system of zinc-dust precipitation with a continuous feed of zinc, but did not obtain nearly as good results as by the above method. At first we had considerable difficulty with the new system, but since learning the proper details of manipulation, it has given great satisfaction. We do not have to trouble ourselves with automatic feeders that get stuck, nor do we have to change the rate of feed from time to time to correspond with the varying value of the solution to be precipitated. Patents upon the method of zinc-dust precipitation have been granted, or are pending in the principal mining countries, the patentees being W. E. Trent and myself. Where ample precipitating capacity is installed, so that time can be taken to almost entirely consume the zinc-dust layer, bullion can be obtained of almost any desired degree of fineness. Although our ore is quite base, one shipment of 1205 lb. of bullion, from the zinc-dust tanks, without acid treatment, averaged 899 fine.

JUNE TREATMENT COSTS AT MEXICAN MILL

	Estimated cost per ton
Milling:	
Crushing and conveying	$0.116
Milling	0.022
General labor	0.117
Labor on repairs and renewals	0.060
Stamping	0.085
Chilean milling	0.222
Tube milling	0.176
Cyaniding:	
General labor	0.212
Labor on repairs and renewals	0.081
Cyanide	0.423
Lime	0.026
Lead acetate	0.021
Thickening	0.017
Agitating	0.053
Heating	0.150
Filtering	0.072
Clarifying and precipitating	0.184
Melting	0.074
Marketing bullion	0.314
Assaying:	
Labor	0.033
Supplies	0.021
Laboratory and testing:	
Special labor	0.027
Total	$2.506



OLIVER FILTER, ASCENDING SIDE, SHOWING WASH PIPES AND SPRAYS

GENERAL RESULTS

The extraction now being obtained is from 93 to 95½%. Thus far the bullion recovered has checked up quite closely with the apparent extraction, as shown by heads minus tails. The extraction would average better if we would stop our experimenting. When the mill was nearing completion, the president of one of the Tonopah companies complimented us on its compact and neat arrangement, and kindly remarked that he thought that we had worked out a very good design. I thanked him, but told him that we did not look at it just his way, because we expected to be designing that mill for the next two years. The last two ounces of silver from the Mexican ore cannot be extracted by the ordinary cyanide process, so that 94 to 96% is the maximum extraction that can be looked for. Most of our experiments are being made for the purpose of ultimately obtaining more practical operation, freedom from shutdowns, and lower operating costs. The cyanide consumption was originally about 3.25 lb. per ton of ore. This has been reduced to 1.25 lb. (100%), but the latter amount appears to be too small; extraction fell to 92%, and we are now increasing the amount somewhat.

The milling cost at first was $3.25 per ton. The net cost of operation for June, 1912, in the treatment of 2349 tons, is shown in the accompanying table: This cost does not include the cost of alterations and additions then being made. We are now installing a second tube mill, which will somewhat increase our capacity. It will probably be some months yet before a reliable statement of costs can be made up.

The problems encountered in the development and operation of the mill have been worked out jointly by Charles R. Morris, mill superintendent, and myself, and as the actual work has devolved upon the former, it is to him that most of the credit of bringing the mill to its present efficiency is due.

A Historic Blast Furnace

When Cedar Point furnace, Port Henry, N.Y., was blown out June 9, 1912, preparatory to being replaced by a new stack, what is believed to be the oldest original furnace shell in operation in the United States ended its long period of usefulness. This shell is credited with a life of 37 years and during the greater part of this period the furnace either was actively producing pig iron or was idle temporarily for relining and incidental repairs, according to the Cleveland *Iron Trade Review*.

In addition to being probably the oldest active furnace in the country, the plant also has the distinction of being historically notable. It was the first furnace to use the Whitwell hot blast stoves which were imported from England at a cost of over $100,000. These stoves were 29 ft. in height and 22 ft. in diameter. It was to equip this stack that Thomas F. Whitwell, the builder, invented bronze tuyeres, which he afterward patented. He also first made use of dynamite and of blow-pipes through the tuyeres for removing scaffolds. The managers of this plant were among the first to use a chemical laboratory to correct their mixtures, and it was the first blast furnace in the country which had a laboratory as a regular attachment to the works.

Cedar Point furnace was designed by Thomas F. Witherbee and was built during the boom period of 1872 and 1873, at a cost of about $700,000. It was blown in in the fall of 1875. At the time of its construction, it was considered the most uptodate blast furnace in the country. Its dimensions originally were as follows: Height, 69 ft., 3 in.; bosh diameter, 16 ft., and hearth diameter, 9 ft. It used anthracite as fuel, but later a mixture of anthracite and coke was adopted. It was first blown in on bessemer iron for the Troy Steel Works. The output was increased from time to time, and the furnace has made as much as 200 tons per day.

Considerable stone was used in the lining of the original furnace and this, quite remarkably, remained until 1903, when it was found necessary to remodel the stack. These improvements were accomplished in an interesting manner. The original shell was left standing and an inner shell was built, 3 ft., 8 in. inside of the former and 23 ft. above the mantel.

Vertical columns, 20 ft., 5½ in. long, were set upon the old mantel and the second mantel was set on top of them to hold the brickwork from this point. The inner shell was water-cooled by sprays. The lining from the top of the first mantel to the second mantel was 13½ in. thick. Above this point, 2 ft. 3 in. of new brickwork were laid and the space between the shell and the new brickwork was filled-in with old bricks. The dimensions of the furnace, when these improvements were completed, were: Height, 70 ft., hearth, 10 ft., bosh, 17 ft. and stock line, 11 ft. 6 in. The hearth jacket consisted of water-cooled plates fastened together by means of links shrunk in position with one large band at the bottom and another at the top. The bosh was constructed by similar water-cooled cast-iron plates bolted together with one large band at the bottom of the bosh and at the tops of the tuyere breasts, which were also of cast iron.

The blowing equipment of the stack, which is still intact, is of interesting design. The engine is of the walking-beam type, which was built by H. G. Morris & Co., Philadelphia, in 1872. It is practically an inverted beam engine. The air cylinder is 100 in. in diameter, the steam cylinder, 60 in. in diameter and the stroke, 96 in. The capacity is about 1200-hp. The steam and air cylinders are vertical and a pair of beams is disposed at either side of the main frame at the bottom. The engine had a pair of outside flywheels, similar to the old type beam engine. This engine is, probably, the only blowing unit of its type ever built. The original Morris engine, built for the plant, is still in serviceable condition and will constitute a part of the auxiliary blowing equipment of the new furnace, when completed.

Sault Ste. Marie Canal Traffic

Freight passing through the Sault Ste. Marie Canals in August was 10,852,852 short tons, an increase of 71,348 tons over July. For the season to Sept. 1, the total freight was, in short tons:

	1911	1912	Changes
East-bound	21,100,586	31,315,627	I. 10,215,041
West-bound	10,387,737	10,169,299	D. 218,438
Total	31,488,323	41,484,926	I. 9,996,603

The total number of vessel passages this year was 13,330, showing an average cargo of 3112 tons. Mineral freights included were as follows, in short tons, except salt, which is given in barrels:

	1911	1912	Changes
Coal	9,342,549	8,990,020	D. 352,529
Iron ore	18,695,622	27,753,132	I. 9,057,510
Pig and mfd. iron	260,684	378,963	I. 118,279
Copper	71,078	60,772	D. 10,306
Building stone	4,137	2,282	D. 1,855
Salt, bbl.	382,826	405,142	I. 22,916

Iron ore was 66.9% of the total freight and coal 21.7% this year. The decrease in coal traffic was entirely in anthracite, bituminous being about even with last year.

The Estimation of Arsenic and Antimony

By Harley E. Hooper*

Having frequently to analyze arsenical concentrates, speisses, slags, mattes, etc., I have recently had occasion to test the accuracy of the current methods. Those which present the most attractive features, as regards ease and rigidity of working, are undoubtedly the methods by which the arsenic is got into solution by a fritting with zinc oxide and sodium carbonate, and afterward extracted with water as sodium arsenate. This, however, invariably gives uniformly low results, as compared with a method I shall describe, which I have proved accurate by using known quantities of pure antimony and arsenious oxide to compose a typical ore. The arsenious oxide in fritting always showed a loss.

For the purpose of comparison, a variety of samples were assayed by both methods, in most cases being run in duplicate. For convenience I have called the old one the "frit method" and the new one the "wet method."

Sample	Frit Method As%	Wet Method As%
Blanket concentrates, "A"	2.4	3.25
Blanket concentrates, "B"	3.4	3.8
Blanket concentrates, "C"	2.3	2.9
Roasted vanner concentrates	0.9	1.35
Raw vanner concentrates	8.7	9.5

A small nickel crucible with a cover was used for the frit determinations, but for the subsequent variations of the frit itself, no cover was used beyond a thick layer of the frit mixture. These were carried out on the last sample: Similar conditions to the last experiment, but no crucible cover, 7.9%; a No. 1 porcelain crucible used instead of the nickel, 5.8%; MgO substituted for ZnO in mixture, nickel crucible, 2.8%; MgO substituted for ZnO in mixture, porcelain crucible, 1.2%. The magnesium oxide was used with a view to determining the antimony in the water-leached residue. When this was tried with the former mixture it was found impossible to separate the large excess of zinc from the antimony when precipitating with hydrogen sulphide.

Varying temperatures were tried with the fritting method, and different rates of heating up to a bright red, but in every case low results were obtained, due, I assume, to a small quantity of the arsenic volatilizing. This was borne out by the loss being greater with an ordinary shallow porcelain crucible than with a comparatively deep nickel one. Large excesses of frit mixture over the usual amount prescribed (10 times the weight of the arsenic present) were tried, but without eliminating the loss. The arsenic in the water extract was in each case determined by the acetic-acid modification of Pearce's silver-arsenate precipitation.

Pearce's original fusion method was tried, but found wholly unsuitable, owing to the large amount of gelatinous silica precipitated after acidifying with nitric acid or acetic acid. The presence of sodium acetate either from this or the fritting method causes a fine white silky crystalline precipitate containing silver, to be thrown down, when silver nitrate is added to precipitate the arsenic. This occurs more particularly with samples carrying only about 1% arsenic; it is soluble on considerable dilution, but a large bulk of solution is inadmissible on account of the solubility of the silver arsenate. My wet method reduces the sodium salts present to a minimum.

Method Finally Adopted

The solutions required are, for arsenic: Ammonium thiocyanate, 7.6 grams of the pure salt per liter; 1 c.c. is equal to 0.0025 grams of arsenic; a strong solution of silver nitrate, to which a drop of ammonium hydrate has been added, the bottle shaken and the precipitate allowed to settle; this insures the absence of free acid; ferric-alum indicator, a strong solution of iron alum, about 1 c.c. being needed for each assay. For antimony: Iodine, about 10.6 grams of iodine in 20 grams of potassium iodide per liter. The iodine can only be weighed roughly and the strength of the solution is such that 1 c.c. is about equal to 0.005 grams antimony.

Take 0.5 to 2 grams of ore, place in a 4-in. casserole and carefully add 10 to 15 c.c. of concentrated nitric acid. Evaporate to complete dryness over a slow heat,, preferably a water bath. When dry, add 15 c.c. concentrated hydrochloric acid and allow to stand for a few minutes in a warm place (don't heat) until the solution of the antimonic oxide is effected. Stir, to break up any crust, and then swirl the whole into a 350-c.c. flask, fitted with leading tubes; wash any residue into the flask with concentrated hydrochloric acid from a wash bottle (no water may be used), warm to about 65° C, only, making up the bulk of the solution to about 50 c.c., and pass hydrogen sulphide until all the arsenic is precipitated and the supernatant liquor is clear. This takes place rapidly and requires little hydrogen sulphide, since flasks may be connected in series. Rewarm and repass hydrogen sulphide, if necessary, but never finish passing the gas unless the solution is cold. Filter cold through an S. & S. hardened 11-cm. No. 575 filter paper, washing three times with cold concentrated hydrochloric acid and then with dilute hydrochloric acid, and finally with water. The residue and filtrate are treated for arsenic and antimony respectively.

*McKinnon Parade West, North Adelaide, Australia.

Arsenic Determination on Residue

Wash into an 8-oz. beaker with as small a quantity of water as possible. Evaporate to just about dryness over a water bath and then add cautiously under the cover a few cubic centimeters of fuming nitric acid. Heat over a water bath until the red fumes and excess of nitric acid are driven off; take up with a little water, warm to dissolve any precipitate, dilute to about 100 c.c., add a few drops of phenolphthalein and then sodium hydrate until two drops past neutral. Add glacial acetic drop by drop until one drop just discharges the red color. Precipitate the silver arsenate by adding the strong neutral solution of silver nitrate, a small quantity at a time, stirring and frequently allowing to settle; the right amount is soon recognized by the precipitate settling rapidly and leaving a clear solution, which gives no further precipitate with a drop of the precipitant. Allow to stand a few hours, if convenient. Filter through an 11-cm. filter, wash thoroughly with cold water, and test the filtrate. Dissolve in dilute warm nitric acid by pouring the acid through the filter and titrate with the standard solution of ammonium thiocyanate, using 1 c.c. of the strong solution of ferric alum as an indicator. Standardize the ammonium thiocyanate with 0.2 grams of silver dissolved in nitric acid or its equivalent of recrystallized silver nitrate.

Antimony Determination in Filtrate

Dilute largely with boiling water, upon which the antimony precipitates immediately. Pass hydrogen sulphide until it is certain that all the antimony is thrown down, filter through a hardened paper and wash with water; hydrogen-sulphide water should be used for fine work, but in ordinary rapid determinations no loss occurs through oxidation of the sulphide. Allow the filtrate to stand in case any doubt is felt as to the thorough precipitation of the sulphide. Wash the precipitate into one of the original flasks with a fine stream of warm concentrated hydrochloric acid, using about 40 c.c. of the acid, warm over a water bath until the antimony sulphide has completely dissolved. To get rid of any trace of hydrogen sulphide, for rapid work it is sufficient to dilute with water and boil for a few minutes, for exact work, however, it is preferable to draw a stream of air through the strong acid solution for about 20 to 30 min., by means of a filter pump using the tubes previously fitted. Add about one gram (according to the amount of antimony present) of tartaric acid prior to diluting, and when the hydrogen sulphide is got rid of, transfer to a large beaker and make up the bulk of the solution to about 200 c.c. Add solid sodium bicarbonate until about two grams in excess of neutrality. Titrate cold with iodine solution to the first appearance of a yellow color or add starch solution near the end and titrate to a blue color.

To standardize the iodine solution, take 0.2 grams of pure powdered metallic antimony, place in a flask with leading tubes and add 40 to 50 c.c. of concentrated hydrochloric acid and then two drops of a concentrated solution of potassium chlorate in nitric acid, and warm over a water bath. Agitate occasionally and add a few more drops of potassium-chlorate solution, if necessary, to dissolve the antimony. When solution is complete, pass hydrogen sulphide through the leading tubes until the antimony is all reduced, this being shown by the clearness of the solution, warm and repass if necessary. Pass air in the opposite direction to get rid of hydrogen sulphide; this point may be tested by plunging strips of filter paper, moistened with silver nitrate, into the flask. Dilute, neutralize and titrate as in assays.

Interferences

The nitric acid in the first dissolving does not, as a rule, effect complete solution of the ore, but this is immaterial since it is thoroughly and rapidly effected in the warm concentrated hydrochloric acid when a stream of hydrogen sulphide passes through it. This latter I have found a remarkably efficient solvent, particularly for any material like roasted concentrates or difficultly soluble iron ores; the former were little affected after being digested in hot hydrochloric acid or *aqua regia* for half a day, but dissolved in a few minutes, leaving a clean siliceous residue, after treatment with the hydrogen-sulphide solvent. The same material was little affected after fusion with alkalis, and had previously been considered most difficult to treat. That the oxides of antimony dissolve in the hydrochloric acid was proven by using metallic antimony and decomposing it with nitric acid.

If copper occurs in the ore in quantities under 10%, it may be held in solution by using a larger amount of hydrochloric acid in the first passing of hydrogen sulphide, taking care to keep the solution warm until saturated with the gas. It is then precipitated with the antimony when hot water is added, and is best separated by digesting the mixed precipitate in sodium hydrate and filtering off the copper sulphide. In case of a larger percentage being present and part coming down with the arsenic, it is easily filtered off, when the solution is rendered alkaline with sodium hydrate.

When the antimony sulphide is dissolved in hydrochloric acid a little effervescence takes place, as the acid is boiled down to a constant strength; this may easily be prevented by diluting with a few drops of water before heating, but desiring to obtain the full efficiency of the strong acid, a couple of experiments were performed, using 0.2 gram antimony in each case: With just sufficient water to prevent boiling, 0.198 gram found; with full-strength acid, 0.1992 gram. Hence the loss is negligible. When 0.2 gram of antimony were taken as before, air passed for half an hour gave antimony, 0.2001 gram, air passed for three hours, 0.1996 gram. This was confirmed as well in other experiments.

The hydrogen sulphide is boiled off before titrating with iodine. If the boiling is continued for long, a considerable loss results, whereas if not long enough, the hydrogen sulphide present gives high results, 0.2 gram of antimony, when diluted slightly and boiled for 1½ min., gave 0.198 gram.

Firedamp Proof Motors

European electrical manufacturers have developed and installed a number of so called, firedamp-proof motors. These motors are totally inclosed with the exception of ventilating openings which are closed with covers designed on the principle of the Davy safety lamp. However, where the motors are operating in an atmosphere of explosive gas, they frequently fail after repeated internal explosions resulting from ignition of the inflammable gas, drawn in through the ventilating openings, and the gas external to the motor is ignited. It is not usual for the ignition of the external gas to take place with the first internal explosion. The General Electric Co. has developed in connection with such motors, an automatic device, the function of which is to disconnect the motor from its line immediately an explosion takes place within the motor.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, eight months ended Aug. 31, are reported as follows, in long tons, except quicksilver, which is in pounds:

Metals	Imports	Exports	Excess
Copper, long tons	86,824	37,148	Imp. 49,676
Copper, 1911....	99,747	51,386	Imp. 48,361
Tin, long tons....	27,658	30,476	Exp. 2,818
Tin, 1911.....	28,609	29,685	Exp. 1,076
Lead, long tons..	138,651	35,799	Imp. 102,852
Lead, 1911.....	150,073	43,885	Imp. 106,188
Spelter, l'g tons..	100,176	6,222	Imp. 93,954
Spelter, 1911....	85,891	6,607	Imp. 89,284
Quicksilver, lb...	3,338,867	1,472,163	Imp. 1,866,704
Quicksilver, '11	3,219,665	1,833,404	Imp. 1,386,261
Minor met's, tons	5,038	17,497	Exp. 12,459
Minor, 1911.....	3,668	14,192	Exp. 10,524
Ores			
Tin ore and con.	19,690	.....	Imp. 19,690
Tin ore, 1911...	19,782	.....	Imp. 19,782
Pyrites	595,047	.....	Imp. 595,047
Pyrites, 1911...	616,699	.....	Imp. 616,699

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Minor metals include nickel, aluminum and the minor metals and alloys.

PERSONAL

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

Thomas H. Leggett has gone to the Southwest.

J. Parke Channing is expected to return from Europe about the middle of this month.

B. H. Bennetts has returned to Tacoma, after being away on a mining trip for a month.

Howard W. Moore is superintendent of the Gigante Mountain Tunnel Co., at La Luz, Guanajuato, Mexico.

C. Colcock Jones, of Los Angeles, Calif., is in the northwestern part of Montana on professional business.

F. B. Lawson, chairman of the Mountain Copper Co., of California, left San Francisco recently on his way to Korea.

Dr. L. D. Ricketts has been in New York during the last fortnight. He expects to return to Cananea next week.

N. E. Linsley, of Spokane, Wash., has been examining some prospects in the Similkameen district, of British Columbia.

D. B. Browne, lately with the American Vanadium Co., is now metallurgical engineer of the Goldschmidt Thermit Co., New York.

Albert H. Fay, of the U. S. Bureau of Mines, has been transferred from Pittsburgh, Penn., to the Washington office of the bureau.

C. O. Mailloux has been appointed assistant to the president of the Granby Consolidated Mining Co., of Canada. This is a new position.

A. W. Davis, mining engineer for the Consolidated Mining & Smelting Co., of Canada, has returned to Trail, B. C., after examining prospects in the Skeena district.

William H. Nichols has been chosen president of the Granby Consolidated Mining, Smelting & Power Co., in place of G. M. Luther, who retires on account of ill health.

Dr. Francis W. Merchant, director of Technical and Industrial Education of Ontario, has gone on an extended tour to Europe to study the technical-school systems in operation there.

J. M. Turnbull, mining engineer for the Consolidated Mining & Smelting Co., of Canada, has been chosen a member of the first senate of the newly organized University of British Columbia.

C. N. Clarke, of New York, president of the Minnehaha Mining Co., recently visited the mine, situated in the Manitou Lake mining district, of Ontario, in connection with negotiations for its sale.

M. Adrienne Badin, president of L'Aluminium Francaise and of the Southern Aluminium Co., is in this country in connection with the business of the latter company, which is now building a plant at Whitney, N. C.

J. H. Cunningham, recently resident engineer, has been appointed superintendent of Extension colliery, in British Columbia, owned by the Canadian Collieries (Dunsmuir), Ltd. He succeeds Thomas Russell, resigned.

William and Wilfrid Donaldson, who have been prospecting in Ungava with a party of 21, in the interest of a Montreal syndicate, headed by John Black, have returned. They refuse to make public anything concerning discoveries before reporting to Montreal.

J. Frank Haig has been appointed purchasing agent of the Pennsylvania Steel Co., Maryland Steel Co., Spanish-American Iron Co., Penn Mary Coal Co. and Baltimoree & Sparrows Point R.R. Co. in place of Stedman Bent, resigned, with headquarters at the Morris Building, Philadelphia.

Arthur Hadley, managing director, and Bernard Price, chief engineer of the Victoria Falls & Transvaal Power Co., have arrived at New York from London, and will visit some of the big electric power plants in this country. They will be accompanied on their tour by Walter G. Clark, consulting engineer.

S. H. Brockunier has been appointed superintendent of the Pennsylvania Gold Mining Co., at Westville, Calif. He is also consulting engineer for the Erie Mining Co. He has been for some time superintendent of the Erie, and under his charge the oreshoot lost some time ago was relocated, and a 40-ton mill built.

Professors Adolf Martens and E. Heyn, of the Royal Material Testing Station, Charlottenburg, Berlin, left New York on their return to Europe on Oct. 3. They have taken a more extended trip than followed by the majority of the foreign participants, among whom they were included, in the recent International Congress for Testing Materials.

William H. Donner, of Pittsburgh, has been chosen president of the Cambria Steel Co., in place of Charles S. Price, resigned. He has been connected with the Union Steel, the National Tin Plate and other companies. J. L. Replogle, for several years assistant to the president, has been chosen vice-president, and will have direct charge of operations at Johnstown.

OBITUARY

William Horace Corbin, vice-president of the Joseph Dixon Crucible Co., died Sept. 25, at Jersey City, N. J. He had been connected with the company for a number of years.

Edwin C. S. Hunt, for some time past connected with the Hoyt Metal Co., and in charge of its St. Louis office, died in that city, Sept. 19. He was born at Bristol, England, and was 57 years old.

V. B. Sherrod died at Mexico City, Sept. 24. Mr. Sherrod has been identified with the mining interests of Mexico for the past eight or nine years, during which time he was connected in important capacities with the largest mining enterprises of the republic. His last work in Mexico was with the Real del Monte y Pachuca Co., at Pachuca, leaving there to take the management of the Gold Roads properties of the United States Smelting, Refining & Mining Co., in Arizona. Mr. Sherrod recently resigned his position with the Gold Roads Co. to return to Mexico, and arrived in Mexico City the day before his death.

S. C. Hazelton, general superintendent of the United States Smelting Co., Midvale, Utah, was killed in an automobile accident near Salt Lake City, on the evening of Sept. 6. The automobile was struck by a street car while endeavoring to avoid a collision with a carriage. Mr. Hazelton was unmarried, and had been identified with the smelting industry since graduation from Lehigh University, late in the 80's. He was connected with various smelting plants that later came under the control of the A. S. & R. Co., such as the smelting works at Monterey and El Paso, and the Germania and Sandy smelteries in the Salt Lake Valley. He took charge of the U. S. Smelting Co.'s copper-smelting plant, at Bingham Junction (now Midvale), shortly after it was completed. He later inaugurated this company's lead-smelting operations in Utah, and except for a year spent in Peru for affiliated interests, he remained at the plant which he had built and in which he had a deep personal interest.

Societies and Technical Schools

American Society of Mechanical Engineers—The local meeting in New York, Oct. 8, was devoted to the question of "Smoke Abatement," considered not only as to its effect in cities, but also as to its results as affecting vegetation and other conditions in the country. At this meeting the discussion was opened by George H. Perkins, head of the Engineering Department of the Lowell Textile School, who attended the International Smoke Abatement Exhibition and Conference held in London in March, as the representative of the society and of the City of Lowell, and his address was not only his report, but also a masterful statement of the whole subject. Authorities from other cities were present to discuss the subject. The question of health, as affected by smoke, was also discussed. One point the society is particularly striving for is the bringing out of data to support the contention that smoke abatement is an economical advantage to the coal consumers.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Oct. 3—The new No. 10, all-steel, 15-cu.ft. dredge of the Natomas Consolidated Co., made the preliminary run on Sept. 29. The boat operated as smoothly in the trial digging as any new dredge could. This is the first all-steel placer dredge to be built and operated in California. No. 8 dredge, of the same construction and type, is rapidly nearing completion.

The concentrator employed by the Placer Gold Co., operating in Kern County, for the extraction of gold and tungsten from the placer gravel, near Randsburg, and owned chiefly by Sidney Coburn, of Los Angeles, is to be supplanted by an improved plant, to consist of five steel sluice boxes, each 20 ft. long, and ranging in width from 14 to 22 in. The 14-in. sluice will be installed at the hopper, to which the gravel will be elevated; the others extending from the first in the order of width, the widest at the bottom end of the sluiceway. Three percolating tanks will be installed between the sluice boxes to save the larger particles of gold and tungsten. A revolving screen will be placed at the end of the sluiceway for the removal of the tailings or waste. The fine gold and flour tungsten will be recovered on three concentrating tables provided with cocoa matting below the sluice boxes. These concentrators are to be 8, 10 and 12 ft. wide, each to be provided with a percolating box at the bottom and extending the full width of the concentrating table. The sluice boxes are to be of double-run type, to facilitate the removal of concentrates without stopping the flow of gravel. The gravels have a depth of 9 to 22 ft. High-grade scheelite is said to be recovered in various sizes from small colors to nuggets of large size.

Denver

Oct. 4—The La Plata region of Colorado, which is now assuming prominence as a gold and silver producer, has just made another stride to the fore, inasmuch as the long-drawn-out litigation between the two richest mines of the district, the May Day and Idaho, has been settled by the owners out of court, and about $80,000, the proceeds of ore and which was tied up in a Pueblo bank, will be divided. A. E. Reynolds, of Denver, the principal owner of the May Day, is on the ground with his superintendent and starting work, and Thomas Welborne, superintendent of the Idaho, is doing the same. The gold output of the La Platas will now be increased.

The production of the Cripple Creek district for September, as given by the mills and smelteries, is 72,955 tons of ore of a gross value in gold of $1,121,780. Three new mills just started are working full time. The Colburn-Clancy process mill, 3000 tons per month capacity, is scheduled to start Oct. 10. The deep drainage tunnel continues to do its work in a satistory manner. The total flow from the portal, as measured Sept. 16, was 9750 gal. per min. In the Gold Coin shaft, which is more than 1½ miles from the tunnel, the total subsidence of the water has been approximately 178 feet.

The City of Denver thinks that 4c. per ton-mile for hauling coal 20 miles, from the northern coal fields, is out of all reason, and strenuous efforts are being made to have the charge reduced. The mayor has notified the Union Pacific that if it does not reduce the rate from 80c. to 40c., the permit for the free use of Blake St. for its tracks will be revoked.

The case of the Consumers' League vs. the Colorado Southern is being tried in the district court. The league is composed of heavy coal and other shippers operating in northern Colorado. It was organized for the purpose of combating the efforts of the Union Pacific, Colorado & Southern and Burlington railroads to oust the state railway commission, and later a suit by the railroads, questioning the right of the commission to fix rates. The decision of Judge Whitford, declaring the commission unconstitutional, was reversed by the supreme court, following which the league appealed to the commission for a reduction in coal rates from northern fields to Denver. The commission cut the rate on lump coal from 80c. to 55c. per ton; mine-run from 70 to 50c., and slack from 60 to 45c. The railroads then brought suit before Judge Whitford, in May, 1910, and secured a decision declaring that no authority was vested with the commission to fix rates, and that a clause in the act creating it, providing that railroads operating over short lines of 20 miles be exempt from the general provision of the act, made the action of the commission null. The act was changed at the extra session of the legislature in 1910, eliminating the 20-mile clause, and Judge Whitford's second decision was reversed by the supreme court.

Butte

Oct. 2—The joint scale committee of the coal miners and coal-mine operators agreed to lay the wage-scale provisions agreed upon by the committee before a delegation of the miners. These were accepted under the condition that a referendum vote should be allowed by the members of the union. As the scale was to go into effect Oct. 1, the coal miners were called out, pending the result of the referendum vote to be taken Oct. 4. The increase in wages will be from 10 to 25c. per day, and especially affects the lower-paid positions.

The Alex Scott company is shipping daily to the East Butte smeltery, about 250 tons of ore, averaging between 5 and 6% copper, with some silver. The 1900-ft. level is being opened and mining is being done below the 900-ft. level. The property consists of only about five acres, but is in one of the richest portions of the Butte district, adjacent to the Leonard mine of the Anaconda company. In view of the fact that the company's holdings in Butte are so small the Moffat copper property in the Bear Gulch district, Madison County, has just been purchased. The vein has been traced for 3000 ft. on the surface and proved to be highly mineralized. On one of the claims a tunnel has been driven 500 ft., opening a wide vein of copper ore. The company will begin operations at once.

Salt Lake City

Oct. 3—Mining has been stimulated throughout the state by the rise in the price of metals. The month of August shows that ore handled by the railroads from Utah mines amounted to 738,806 tons, a gain over August, 1911, of 194,282 tons, or 36%. While more ore is being actually mined, a study of the freight figures shows that there has been an increasing production from old dumps and slag piles. At the Ontario mine, in Park City, a leasing company has built a mill for treating the dump ore and old stope fillings. This mill is being tried out at present. The zinc ores at Tintic are being mined at a good profit, now that the reduced freight rate has gone into effect. The Yankee has met expenses from the sale of dump ore for some time, and the Horn Silver, in Beaver County, is shipping a large tonnage monthly of ore from second-class dumps. The capacity of the mills at Garfield had been largely increased, and during August the

output of Bingham was over 13,000,000 lb. of copper in addition to its lead, silver, zinc and gold. Increased activity is noticeable in the Tintic district, the output being 20 or 25% greater than last year.

Negaunee, Mich.

Oct. 2—The Oliver Iron Mining Co. has procured the Country Club, near the old Goodrich mine, three miles southwest of Ishpeming, and has made the place into a "Rest Farm." The institution is for the convenience of employees and their families who desire a vacation, and will be in charge of the visiting nurse of the company. A similar undertaking was previously inaugurated by the Cleveland-Cliffs Iron Company.

Toronto

Oct. 4—An interesting development in connection with the plans of the Dominion Iron & Steel Co., is shown by the purchase by this company of its first coal lands in western Canada. The property referred to is known as the Ford, and consists of 12,000 acres on High River, south of Calgary. The Dominion Coal Co.'s output for September was approximately 380,000 tons. This is somewhat below the figure for August, but is the best September showing that the company has had in its history. At the present rate of production, the output for the year should amount to 4,500,000 tons.

The output of the Nova Scotia Steel & Coal Co. for September, is as follows: Coal mined, 67,889 tons; coal shipped, 87,789; pig iron produced, 7490; steel ingots, 6722; iron ore mined, 57,913; and shipments of iron ore, 61,800 tons.

Sudbury, Ont.

Oct. 5—The season now closing has witnessed important progress and expansion in the nickel industry. The Canadian Copper Co. has enlarged its smeltery at Copper Cliff so that it will soon be able to treat about 5000 tons of ore daily. The work of opening the new No. 3 mine, formerly the Frood, is well under way. One inclined shaft is being sunk to a depth of 1000 ft. vertically and another will soon be begun. Elaborate underground development is planned and modern devices for cheaply handling ore have been adopted. The mining equipment will include electric underground haulage and the ore will be taken from the surface veins by gravity into the cars in which it will be hauled six miles to Copper Cliff over an extension of the company's railroad, now built. The mine will be operated by electricity furnished from the company's hydro-electric plant. The ultimate capacity of the equipment for the No. 3 mine will be about 10,000 tons daily. The ore developed by drilling is reported to exceed 60,000,000 tons. Much of this is mixed ore and lower than average grade. The Canadian company is still operating the Creighton, Copper Cliff, and Crean Hill mines, the chief supply coming from the Creighton. In the early summer the company took options, mostly on a drilling basis on large areas chiefly on the North Range but later they were all relinquished except the one on the Strathcona, in Levack township, on the North Range. This property is now being drilled.

The Mond company is still engaged in the erection of its new smeltery at Coniston, about eight miles east of Sudbury, on the Canadian Pacific and Great Northern railroads. This installation will not be completed before next summer. It will have a capacity of 1000 tons of ore daily, about three times that of the company's present plant at Victoria Mines, west of Sudbury on the "Soo" line. The Victoria plant will be abandoned when the new one is in commission. It was expected that the Victoria mine owned by this company would be worked out by now, but at depth new orebodies have been disclosed according to report. The company is extensively operating its Garson mine, east of Sudbury, and development is disclosing large bodies of mixed ore. The company recently began reopening its North Star mine, near the Creighton. The Blue Lake lots were drilled last winter, but the option has been relinquished, as was also the option taken two years ago on the Worthington and Blezard properties.

The Dominion Copper & Nickel Co., controlled by John R. Booth, of Altoona, and M. J. O'Brien, of Montreal, is actively drilling its recently acquired properties on the South Range. These include the Murray, purchased from the Virrain estate, of Swansea, and the Gertrude and Elsie mines, acquired from the Lake Superior Corporation, together with the Victor on the North Range. The company is sinking on its Whistle mine in the northeastern part of the district, and is exploring, under option, the Blue Lake, Kirkwood, and some other properties. It is announced that the company will erect a smeltery next year near the Murray mine. This company has in the last five years spent about $250,000 in drilling.

Some new companies have been interested in the district during the summer, but as far as is announced there has been no commitment by any of them. British interests have renewed negotiations for the Levack group and other properties on the North Range, and the Guggenheims have been making investigations for several months and are reported to have a number of options. However, there has been little exploration or development work done by any of the owners of nickel prospects outside the large companies. Much new ground has been located on the eastern end of the "contact" and on the North Range, so that now practically all of the 100 miles of contact is located.

Porcupine

Oct. 4—Much has been written lately of an irresponsible nature regarding the rate at which the Porcupine mines are producing bullion. Due to the reticence of the companies, it has been difficult to obtain authoritative information, and, as a consequence, the public has been treated to a series of wild guesses, all of them naturally being overestimates. As a matter of fact, Porcupine is at the present time producing at the rate of approximately $4,500,000 per year, and there is not much probability of an increase until the present plants are enlarged or until other mills are in operation.

At the Hollinger, strenuous efforts are being made to make a good showing for the first six months of operation, and also in order to enable the company to pay a dividend before the first of the year. At present, about 310 tons of ore per day is being treated, but when the other 10 stamps are in commission, this amount will be materially increased.

At the Dome, another tube mill and slime press have been ordered, and more leaves will also be added to the present slime presses. This will raise the capacity of the plant to nearly 450 tons per day. The primary plates before the stamps are being taken out and only amalgamating plates following the tube mills, will be used. The mine is in excellent shape and there will be no difficulty in supplying any increased ore needed.

With regard to future production, a greater output may be expected from both the Dome and the Hollinger within six months. The Dome Lake mill will also be in operation by next spring and the output from this mine and the increased capacity of the McIntyre should add materially to the camp's production. Small mills are also being considered for the Hughes, Pearl Lake and McEnaney. The Jupiter and Plenaurum are also considering the installation of a mill to treat the ores of both properties.

Rossland, B. C.

Oct. 2—The Rossland miners' union, following the advance in wages in Butte, Mont., recently demanded an increase in wages of 50c. per day for all men employed in and around the mines. As the Rossland mines are benefited but little by the advance in the price of copper, the demand for so large an increase in the wage scale, based as it was on the rise in the price of copper, could not be allowed without serious losses to the companies operating in this camp. The difference in the conditions existing here, and in camps where copper is the principal product, was explained to the men, and a proposition covering a raise of 25c. per day for all men working underground was made and accepted. On Sept. 1, the increase went into effect.

The Mining News

The Current History of Mining

Alaska

Bonanza Gold—This company has taken over the Good Hope property. A stamp mill, concentrator, compressor and drills have been ordered, and will be installed as soon as they arrive. Frank A. Iverson, Seattle, is president of the company.

Arizona

Gila County

Miami—Three 8-ft. Hardinge pebble-mills are in transit, which will replace the chilean mills in the second unit, making four of the six units that will be thus equipped. At the No. 4, or main shaft, foundations are being laid for the new change house, the new machine shop is being equipped, and the new office is being finished. The construction of the Miami-Inspiration hospital is well under way. About 1000 men are employed.

Inspiration Consolidated—The main east shaft was 305 ft. deep Oct. 1 and the main west shaft 435 ft. deep; sinking continues steadily. Development work is confined to opening the first haulage-level and 3800 ft. was driven in September as compared with 4900 ft. in August, the decrease being due to the fact that much of the September work consisted in widening and timbering the drifts previously driven. At the Live Oak mine, drifting from No. 2 shaft on the 570-ft. level continues, No. 1 shaft is being sunk, and the Sulphide tunnel is being widened for electric haulage. McArthur brothers are using a steam shovel in grading for the railroad.

South Live Oak—Churn-drill hole No. 4 has been started about 1000 ft. west of hole No. 3 in silicified, copper-stained schist and is now down more than 50 feet.

Southwestern Miami — Churn-drill holes, Nos. 4, 7 and 8, are respectively 640, 1267 and 1020 ft. deep. The last two holes are reported to be in chalcocite-bearing schist. Hole No. 7 is being reamed, preparatory to drilling deeper. It is not stated whether the material disclosed in holes 7 and 8 is commercial ore.

Gibson—Five cars of chalcopyrite ore were shipped to the Old Dominion smeltery in September. T. Henderson superintendent.

Superior & Boston—John Gibson, who is leasing on the Black Oxide vein of this mine, corresponding to the Buckeye vein of the adjoining Buckeye mine of the Old Dominion company, has shipped to the Old Dominion smeltery three cars of ore from stopes above the tunnel level and is loading a fourth.

Mariposa County

Relief Gold Mining Co.—This company will erect a cyanide plant for treating the tailings dumps and low-grade ore from the mine 12 miles north of Glendale.

Slocum Copper Mining Co.—This company will soon begin shipping ore from the Slocum and Cottonwood group north of Phœnix.

Tip Top—The concentrator will be started in the near future. The ore contains silver and tungsten minerals.

Arizona-Vermont—In driving a crosscut a stringer of high-grade copper ore was recently found.

Santa Cruz County

The deposit of onyx found in the caves near Greaterville, near the north line of Maricopa county, are being worked with regularity. The grade of onyx is said to be good, but some of the best pieces recovered, slake when exposed to the outside air and fall apart; the owners are seeking a remedy for this. The demand for the product is good, and the profits are enough to warrant a continuance of shipments.

World's Fair—This silver producer for a dozen years or more, has been turned over to the engineers for the Copper Queen Mining Co., for systematic development work. The owners have made no effort to open the copper ore in the mine, but have shipped the richer silver ore. The mine is about four miles from the R.R.R. mine.

Bland—This copper mine in the Santa Rita range, is under option to M. A. Brickson, representing Colorado men. He is also considering other mines in the neighborhood, with the idea of building a central custom mill.

Alum Gulch—A. S. Henderson, of Patagonia, reports having optioned this mine to Boston men.

Royal Blue—Thomas Fraser, a mining contractor, who is now taking out ore from this mine reports a new strike in the drift on the 150-ft. level. He is mining about three tons per day of $40 ore. Owing to lack of teams, he has been unable to ship it.

Connecticut — This mine has been leased by R. R. Richardson, of Patagonia to Hogan, McCutcheon & Bohlinger, the last being the miner who made the big strike on the R.R.R. The lessees have timbered the upper tunnel, put in track and are now stoping ore; the ore is chalcopyrite carrying some gold and silver.

American Boy—Another shipment has just been made from this mine, an interest in which has been bought by James B David, who is now driving a 400-ft. drift on the lower tunnel level.

Oro Blanco—Ore shipments to the Pioneer smeltery continue.

Montana—McDermott and Powell have opened a large shoot of ore, and have raised a good tonnage, which at present lies on the dump. Treatment problems have to be solved before this ore can be utilized, and as the hauling charge is excessive, the owners are considering a plant on the ground to treat this and ore from surrounding mines.

Guija—Max Junghandel is working the tungsten-bearing claims he recently bought from Bent & Sampson; Charles Bent, Jr., is in charge of the work.

Ivanhoe—Small shipments of rich silver ore are being made from this mine. The ore is made up of native silver and unusual silver minerals like stromeyerite, proustite, polybasite and polyargyrite. The F. J. Hobson Co., of Nogales, is taking most of these small lots, as well as most of the lead ore now being mined in the county.

California

Amador County

Keystone Consolidated—The state supreme court has reversed the superior court which gave judgment for $20,000 to Edward Lynch. The plaintiff was attorney for the company and claimed the amount sued for under an agreement for salary and bonus. The supreme court held that the contract did not state a specific time for payment and that the amount should be paid out of the proceeds of the mine. The property is in the development stage, being an old mine reopened. It is now known as the Keystone Mines. C. R. Downs is manager.

Lincoln Consolidated—The south drift has, in the last three months, been extended 857 ft., making a total length of 1988 ft. This drift is toward the Wildman-Mahoney and is 450 ft. lower than

the 1300-ft. Wildman level. It is between good walls and has passed through several bunches of quartz and has ore in the breast. The west drift on the 1200-ft. level has been extended 152 ft. The east crosscut from the 1950-ft. level is now in 802 ft., passing from gray to black slate. No work has been done on the 800-ft. level in the last quarter, but driving on this level will be resumed as soon as additional transformer capacity is secured. A long term contract has been made with the Pacific Gas & Electric Co. for power and water. New gear and pinion, and cable have been installed. The quarterly report for the period ended Sept. 15 shows receipts of $15,794, including a balance of $2703 from the preceding quarter, and expenditures of $12,666 with a balance of $3128 on hand. W. J. McGee, of Sutter Creek, is general manager.

Hardenberg—The owners have decided to install a 20-stamp mill, for which nearly all the contracts have been placed. This decision is the result of encountering a vein from 4½ to 7 ft. wide in the crosscut from the 1078-ft. level of the vertical shaft, a distance of 215 ft. west of the shaft. The average assay is $5.58 per ton. The power equipment is equal to the demands of 40 stamps. H. Malloch and John Martin, of San Francisco, are the principal owners; N. S. Kelsey, of Jackson, is superintendent.

Butte County

Gold Bank—The remodeled 20-stamp mill is completed and a cyanide plant has been ordered. The extraction and crushing of ore will begin probably with the present or next week.

St. Francis—A breaker and a new Bryan mill are being installed at this mine, near Enterprise, about five miles northwest of Forbestown.

Calaveras County

Fifteen new mining claims have recently been located, including gold, copper and asbestos prospects. The districts are Albany Flat, O'Neils Creek, Copperopolis, Glencoe, Railroad Flat, Mill Valley, and Murphys.

Morgan—This property, near Mokelumne Hill, has been bonded to C. A. Rice. The 140-ft. tunnel is said to be in good ore. Frank W. Peek and Frank Mondani are owners.

Eldorado County

Cambrian—It is reported that J. B. Bernardi, of Reno, is contemplating reopening this mine near Lotus. The property was worked in early days, but has been idle for several years. The holdings embrace 800 acres of land.

Landecker—S. C. Ames, of San Diego, has recently purchased this gravel mine, and it is reported that he will reopen it within 60 days. The property is equipped with a barrel mill. N. H. and B. E. Burger, of Placerville, were formerly owners. Ames also owns the Helper, the Tin Cup and the Margaret claims in which other San Diego men are interested.

Humboldt County

Ruby Copper Co.—Good ore is reported in this company's property on Horse Mountain in a tunnel at a depth of 300 ft. E. A. Walters, of Eureka, is president.

Monterey County

Foreign Mine Development Co.—An auto-truck train of four ore trucks, drawn by a 150-hp. motor, has started from San Diego for Borax Lake, to be used for hauling the soda product to Searles, on the Nevada & California R.R., a distance of about 35 miles, for rail shipment. The motor and trucks were shipped from the factory of the Daimler Motor Co., Coventry, England, about five years ago, and have been in storage at San Diego.

Los Burros Mining Co.—A gasoline hoist is to be installed at the mine, in Reliz Cañon, in the Los Burros district, near Salinas.

Green Monster—O. H. Lawrence, of Park City, Utah, has taken a bond and lease on this mine, near Citrus, about 10 miles east of Independence. It was operated in the early seventies and shipped copper ore. The ore contains gold and silver also. A wagon road is being built to the mine, and loading chutes will be installed. Julius Roper, of Independence, is owner.

Shasta County

Afterthought—S. E. Bretherton, manager, who returned recently from New York, is preparing specifications for the installation of a reduction plant of daily capacity of 50 tons, for the recovery of zinc and also the gold, silver and copper contents of the ores that are blocked out and ready for extraction. Should this plant prove successful, it will be enlarged by one or more units, increasing the daily capacity to 200 tons, by the time the California, Shasta & Eastern R.R. is completed.

Tuolumne County

Dutch—The full 40 stamps have been dropping steadily since May, and crushing about 180 tons per day, resulting in about 87% recovery. At the time of increasing the stamps from 20 to 40, the mill was equipped with Johnson concentrators, built by the Union Iron Works, which are reported by the manager to be giving satisfaction. The shop has been equipped with a Word drill sharpener, lathe and other machinery; and a 150-hp. electric motor has been installed for operating the compressor. A 225-hp. General Electric motor is being installed for operating the hoist; the steam-hoist engine will be retained as an auxiliary.

Colorado

Clear Creek County

Vindicator—The crosscut tunnel on this property, on Chicago Creek, has been advanced to a length of 1000 ft., and a drift has been driven 60 ft. north on the vein. In the drift the vein is 4 ft. wide and contains a 7-in. streak of smelting ore. At present the development will be continued by hand, but in the near future a compressor plant and machine drills will be installed. J. J. Hoban, of Idaho Springs, is manager.

Clear Creek Tunnel—This 8x8-ft. crosscut tunnel has been advanced to a total length of 550 ft. The company contemplates continuing development throughout the winter.

Franklin—This property, in Gilson Gulch, is being developed by lessees. The shaft will be sunk to a depth of 150 ft. The operators report that a 10-in. vein of silver-lead ore is paying the cost of sinking.

Harris—A new oreshoot has been opened in this property, in East Argentine. The vein is 14 in. wide and high assays in silver have been obtained.

Bellevue-Hudson—It is reported that a 12-in. vein has been opened. Three carloads have been shipped. Mr. Boyce is manager.

Scott—This group, in the Daily district, is being developed under the management of W. A. Pruntz.

Duluth & Empire Tunnel Co.—This tunnel is being steadily advanced. Frank Brady is manager.

Marshall-Russell—It is reported that this company contemplates consolidation with the Gold Dirt, and Empire Tunnel Co. It is the intention of the owners to develop the combined properties through one of these two tunnels, with the view of reducing operating costs. At present Mr. Rockwell is manager of the Gold Dirt mines and Mr. Marihugh is manager of the Marshall-Russell Co. The development work under consideration will involve the installation of considerable additional mining equipment and an increase in the working forces.

Stanley—During September, the fifth level west heading was advanced 101 ft. to a total length of 1445 ft. The breast is in 4 ft. of ore.

Denver County

Western Chemical Co.—This company's four-story warehouse was destroyed by fire, Oct. 3. The building contained equipment for the manufacture of sulphuric acid and a large supply of chemicals. The company's ammonia and hydrochloric-acid plants were saved. The preliminary estimate of damage is $100,000, about two-thirds of which is covered by insurance.

LAKE COUNTY-LEADVILLE

Fryer Hill, which has been actively mined for 33 years, is still sending out a big tonnage, this being chiefly due to the discovery of zinc-carbonate ore. The lessees on the Chrysolite are cutting a working station at the 210 level whence they will drive out to the ore, and the shipments of zinc and iron will be increased. Lessees on the Amie are raising to the high-grade ore found in the level above. The Little Chief has resumed shipments and a carload of good-grade zinc ore has been sent out. From the Matchless, shipments of a fair tonnage of siliceous ore is being sent out.

Starr Placer—The season's cleanup, just made, gives each of the four men who have been at work since the middle of May $5 per day for the days worked. This was accomplished with old-fashioned sluice boxes.

Siwatch Tunnel—Manager Morner is driving two laterals and shipping low-grade ore.

New Monarch Mining Co.—Manager Watson is still shipping from the Cleveland dump and sampling other dumps for shipping ore.

Gold Basin—Regular shipments of low-grade ore are being made by lessees in the Gold Basin shaft, Breece Hill.

Favorite—The production by lessees, J. F. Johnson & Co., on this mine in South Evans, gulch is about 60 tons per month of sulphide ore carrying gold and silver.

MINERAL COUNTY

It is just reported that a strike of rich manganiferous silver ore, has been made in the Happy Thought block of the Creede Mining Co. It was found in a crosscut from the 800 level. Important discoveries of lead and zinc ore have also been lately made in the Amethyst and Last Chance, both on the same vein, this work being done by the Creede Triune Mines Company; W. S. De Camp, superintendent.

PITKIN COUNTY

C. H. Coberly, superintendent of the Montezuma mine, is authority for the statement that about 4000 tons of $40 ore is now blocked out between levels and this will be leased in blocks at 15% royalty.

TELLER COUNTY-CRIPPLE CREEK

Stratton's Independence — During August 2872 tons of ore averaging 13 dwt. 12 grains per ton, was produced, and 11,000 tons of low-grade mine and dump ore was milled. The net working profit was $12,000, less $1120 for special development work.

Elkton—At this mine on Raven Hill the 11th or bottom level is being developed and the oreshoot has been drifted on for 800 ft. with 500 ft. more to be opened. The Raven and Beacon shaft is down 244 ft. and 3½ ft. advance is being made per day.

SAN JUAN DISTRICT

Tomboy—Preliminary arrangements have been completed for the construction of the new tramway from the Ophir tunnel to Pandora. The Bleichert system will be installed. The equipment will be supplied by the Trenton Iron Co. An attempt will be made to complete the installation this autumn. The tram will have a total length of about one and one-quarter miles and a fall of about 2000 ft. It is estimated that a substantial economy will result in the transportation of mill products to the railroad and supplies for the mines. At present all freight and concentrate is hauled in six-horse teams on a wagon road having a grade of from 12 to 16 per cent.

Idaho

COEUR D'ALENE DISTRICT

Bunker Hill & Sullivan—A dispatch states that a fire broke out in the mine, Oct. 7, and that up to the following day, fire fighters, equipped with oxygen helmets, had not gained control of the flames. One man is reported overcome by the smoke.

Tamarack & Custer Consolidated Mining Co.—It is announced that this company has leased the Rex mill, on Nine Mile Creek. It is the intention of the management to hasten preparations for active mining and milling. The property will probably enter the list of shippers within a few weeks. With the lease of the mill, the Tamarack company secures the use of the aërial tramway formerly used by the Rex. This will be changed at once to connect with the property of the leasing company and will allow rapid completion of operating plans. The Rex mill has a capacity of 400 tons per day.

IDAHO COUNTY

American Eagle—The Rio Tinto Mining Co., of Hamilton, Ontario, which has an option on this property, has begun work on the mine under the management of J. McDermid. The development work mapped out consists of sinking a new 500-ft. shaft and connecting tunnels Nos. 1 and 2 by a raise. Numerous improvements will be made in a general way about the property. A force of about 20 men is at work. A. W. Boyd is mine superintendent.

Mascot—The new mill was started Sept. 20. It is a 3½-ft. Huntington driven by water power under 120 ft. head. The first ore run through the mill came from the St. Lawrence mine about 1000 ft. from the mill. The property is owned and operated by the Massam brothers.

South Fork—The mill has started up again after a five-days shut-down for repairs. The mine is in good condition, one shift keeping the mill supplied with ore. The new No. 4 tunnel is progressing rapidly, opening up a new oreshoot.

Brown Bear—The company is building a wagon road to connect its camp with the county road. Development work in the east tunnel has progressed satisfactorily, opening up a good body of ore.

Michigan

COPPER

Superior—Railroad connections are being made to afford transportation from this property and also the Isle Royale to the Lake Milling, Smelting & Refining Co. mills, at Point Mills. The west lode tributary to No. 1 shaft is being opened and put in shape for stoping, it being advantageous to do this mining before mining the No. 1 Superior lode.

Wolverine—The exploratory shaft on the Osceola lode is bottomed at a depth of about 500 ft., but sinking will probably be resumed in the near future. At the fourth level drifts are being driven in both directions; driving is also being done on the No. 3 of a series of three lodes that were exposed by the crosscut driven from the 24th-level drift toward the Old Colony boundary.

Ahmeek—This company is finding a large quantity of mass copper in fissure veins. A drift has been driven on one of these veins for a distance of about 50 ft. from the shaft with good results, and considerable copper is being developed.

New Arcadian—This company's shaft, which is down about 150 ft., is being sunk on the lode, which lies between two other similar formations that were revealed in drilling. It is planned to sink to a depth of about 1500 ft. and then start lateral openings on the three formations, driving crosscuts east and west to reach the other two lodes.

Winona—This company has succeeded in obtaining additional labor, so that production can be increased. About 700 tons are being shipped to the mills daily, where the two heads are in operation part of the time. During the next few weeks this company will probably be in shape to handle about 1000 tons daily. Extensive experiments are being carried on at the concentrating end of the mill in hopes of bettering the savings.

IRON

Oliver Iron Mining Co.—This company has completed the installation of safety devices at its ore-crushing plant, at Escanaba, where the hard ores from its Menominee Range mines are crushed. The cost of safeguarding the machinery is reported to be $5000. The safety committee from the company's Marquette Range mines, where the installation of safety devices was finished some time

ago, inspected the work at the ore-crushing plant.

Cleveland-Cliffs Iron Co.—Options have been taken in the Crystal Falls district in Sec. 12, 42-33, between the Dunn mine and the Mastodon. The land will be tested by sinking pits before drilling is started, as the surface is not excessively deep. The options were secured from Doctor Carpenter and Benjamin Neely. The company has no mines in the Crystal Falls district.

Florence Iron Co.—This company is hurrying development work at its Ernst mine, in Commonwealth, Wis., and at its Bates mine, in the Iron River district, and will equip both properties with modern electrical machinery. The Bates mine, which has been flooded with water for several months, due to inadequate pumping facilities, has been delayed in development on account of lack of proper machinery. Lowe Whiting is in charge at the Bates mine. The company will try to make each property a shipper by next season.

Verona Mining Co.—An Ingersoll-Rand electrical air compressor has been purchased for the Bengal mine, in Stambaugh. The machine is similar to the one recently installed at the Davidson mine, and is of 2500 cu.ft. per min. capacity. The Bengal will be one of the big mines of the Iron River district.

Ravenna—At this M. A. Hanna exploration at Crystal Falls, it is planned to sink a new shaft, about 300 ft. southwest of the present shaft, for ventilation purposes. Machinery and buildings from the old Hollister mine, now closed down, are being moved to the Ravenna, including boilers, compressor and an office building.

Minnesota

Cuyuna Range

Cuyuna-Mille Lacs—It is expected that tracks from the Cuyuna Northern R.R. will be laid to this property in the near future, whereupon shipments from the 4000-ton stockpile will be made at once. Ore is now being hoisted through the 135-ft. shaft at the rate of 50 tons per day. A 1000-gal. pump has been installed in the pump station on the 126-ft. level, and a drift has been started. The ore contains much manganese, the amount of which appears to increase as the shaft is sunk; the assays from the shaft are higher than those from the drill holes.

Mesabi Range

Oliver Iron Mining Co.—This company has cancelled many mining leases on property at the west end of the range, near Grand Rapids, Minn., exploration work has been done and royalties have been paid on this property for three years. No reason for the cancellations has been given.

Scranton—Loading from the stockpile at this mine has been resumed after a cessation of several weeks, while repairs were being made to machinery. Three trains per day are being loaded at the stockpile and two at the Leonard pit. The average is now 275 cars of ore shipped per day.

Vermilion Range

Consolidated Vermilion & Extension Co.—Test pits on a part of this company's property, more than one mile from the shaft, have shown that the ore comes to within a few feet of the surface. The face of one drift is in good ore and a small tonnage is being raised and placed upon the stockpile.

Montana

Deer Lodge County

Hidden Lake—Preparations are being made to start operations on a large scale next spring at this property in the Georgetown district. The last carload of ore recently shipped from the mine gave returns somewhat higher than average shipments have been of late.

Granite County

Big Bill—A wide vein of gold ore has been opened on the 50-ft. level of this mine in the Red Lion district, and preparations are being made to operate during the winter. G. W. Gordon, one of the owners of the property, is superintending the construction of new quarters for men.

Sunday—Paul Scott and W. P. Scott, of Phillipsburg, who have been working the tailings dump of this property on a lease since early in July, have made their last cleanup for the season. The tailings were worked by the cyanide process. The Sunday mine is owned by the Corey Estate, of Butte. It was operated through a tunnel.

Lost—A narrow stringer of decomposed quartz and porphyry has recently been opened in this claim in the Red Lion district. Some rich gold ore in kidneys has been discovered, one lump weighing six pounds bringing returns of $649.95.

Jefferson County

Boston & Corbin—During the year ended July 31, $91,514 was expended by this company in development and construction work at its property in the Corbin-Wickes district. The company ordered the erection of a 200-ton concentrator, and to provide funds sold 10,000 shares of stock which netted $7.50 per share, and this, added to the amount in the treasury, gave an ample amount to carry the work through. Work upon the mill has begun, the machinery has been contracted for, and it is expected that the mill will be in operation in February 1913. During the year a new vein was opened on the 1200-ft. level and drifted upon for a length of 33 ft., both faces being in ore of good width and value.

Nevada

Comstock Lode

Mexican—The plans for sinking a winze in the northern portion of the mine have been changed, it being originally intended to continue the winze, started more than a year ago on the 2500-ft. level, in the rich ore, which was stopped on account of water being encountered, as well as other difficulties. The projected new winze will be started north of the stope, and close to the north boundary, as a winze there will also enable Union Consolidated to explore its ground readily from the winze at greater depth. Another fact in favor of the new site is that it will be possible to sink in more solid ground that in the ore vein. A large ore recovery was made in a recent week, 463 tons being hoisted from the mine, the total assay value of which was $18,500. Nine bars of bullion, valued at $25,000, were shipped from the mill.

Crown Point—Ore shipments have been resumed at the Yellow Jacket mill, recently overhauled, and the plant is being operated at full capacity. The ore recovery during a recent week was 500 tons of low grade. The new incline winze below the sill floor of No. 1 stope, on the 1400-ft. level, is in ore.

C. & C. Shaft—The north compartment has been cleared for the installation of the second vertical pump, which is to be placed opposite No. 1 pump at the 2500-ft. level. The latter is giving satisfactory service, being the first electrically driven pump to be used in the sump.

Ward Shaft—The water is being lowered from the 2150 to the 2475 level by bailing, in an effort to recover the Scranton pumps.

Esmeralda County

Goldfield Consolidated Mines Co.—The estimated September production is as follows: Total tons mined, 29,460; gross value recovered, $390,000; operating expenses, $190,000; and net realization for month, $200,000. The tonnage is low at the mill on account of repairs; shipping ore low on account of Grizzly Bear shaft work.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended Sept. 28, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,650	130,419
Tonopah Belmont	3,300	91,500
Montana-Tonopah	1,027	40,300
Tonopah Extension	1,057	38,891
West End	1,025	29,147
Midway	50	520
MacNamara	465	14,150
North Star	.....	170
Mizpah Extension	.....	40
Jim Butler	300	1,900
Totals	10,874	347,037
Estimated value	$271,850	.....

Montana-Tonopah—The annual meeting was held at Tonopah, Oct. 1, the secretary's report showing cash in hand amounting to $230,945. During the fiscal year the company paid $160,000 in dividends and invested $191,391 in the purchase of the controlling interest in the Commonwealth mine at Pearce, Ariz.

Tonopah-Belmont—The Mizpah fault vein has been opened on the 12th level and is five feet wide. The usual quarterly dividend of 25c., per share, amounting to $375,000, has been declared.

Tonopah Extension—Four feet of rich ore has been opened on the 400-ft. level of the North vein. The oreshoot on the 500-ft. level of the South vein has now been proved for a length of 750 feet.

Tonopah Merger—The west drift on the 980-ft. level is 135 ft. in the vein. Shipments to the old Belmont mill will be commenced shortly.

Jim Butler—The crosscut on the 600-ft. level has penetrated a width of 60 ft. of vein matter filled with streaks of ore. A winze is being sunk on one of these three feet wide and assaying $30 per ton.

West End—The mill capacity has been increased to 150 tons daily by crushing through a coarser screen and running the tube mills at greater speed.

White Pine County

The principal mines of the Ely district are idle as a result of the efforts of President Moyer, of the Western Federation, who induced the miners to go out after the voluntary advance in wages by the Nevada Consolidated companies had been practically accepted by the steam-shovel men, carpenters, machinists, millmen and smeltermen. The company had offered an advance of 25c. per day to those receiving $3 and over, and 20c. advance for those receiving less than $3. The Steptoe concentrator ran for several days after mining ceased and the smeltermen are still at work; there is about two weeks' supply of concentrates and secondaries at the smeltery. The miners are standing out for a 50c. increase and recognition of the union. The officials of Nevada Consolidated, the principal operator, are stated to be unalterably opposed to recognition of the Western Federation of Miners.

New Mexico

Socorro County

Ernestine Mining Co.—Thirty stamps are dropping, resulting in increased bullion shipments.

Mogollon Gold & Copper Co.—Work has been started on the properties adjacent to Mineral Creek; 200 tons of ore was recently mined from the Little Charlie tunnel.

Deadwood Mines—Recent development has opened new ore on the 400 level. Both drifts are being advanced on the 500 level. The new sampler has been placed in commission; 620 tons of ore was treated in a fortnight, resulting in the production of five bars of gold and silver bullion and 40 sacks of concentrate.

Socorro—September's mine developments were satisfactory and the mill is running steadily on good-grade ore.

Oaks Co.—The best ore yet encountered in the development of the Pacific mine is coming from the bottom of the South shaft at a depth of 190 ft.; 165 tons was produced from the Pacific and Johnson mines in two weeks and good ore is being mined on the Mother Lode.

Trilby—Five prominent New Mexico men have taken a bond and lease on this group and active work will be started as soon as machinery can be installed.

Deep Down—The shaft was sunk 25 ft. in two weeks, yielding 75 tons of good milling ore.

Oregon

Lane County

West Coast—This property is being developed by a deep tunnel, and the management reports striking some good ore. The mill is kept running part of the time; 20 of the 30 stamps being in operation. There is an abundance of free-milling ore of good grade blocked out in the upper workings of this mine.

Treasure—Charles Phelps, of Los Angeles, Calif., has taken charge of this property, which is owned by Portland, Ore., men, and he will put in some new amalgamating machinery, manufactured by the Gold & Platinum Extraction Co., of Los Angeles. A promising new vein has recently been uncovered.

Green Rock—This company is considering building a 50-ton mill in the near future on the property, in the Bohemia district. H. H. Bergeson, of Seattle, is president.

Utah

Juab County

Tintic shipments for the week ended Sept. 27 amounted to 213 cars.

May Day—It is stated that net earnings for September will be between $12,000 and $15,000, this coming from the sale of zinc ore. A large tonnage of zinc ore has been developed, and October shipments are expected to equal or exceed those of September.

Swansea—During the year just ended, there were produced 10,700 dry tons of ore on company account and 181 dry tons of lease ore. The metal content was as follows: Gold, 452 oz.; silver, 129,276 oz.; lead, 97,885 lb. Receipts, from ore sales and royalties from lease ore amounted to $62,825; and assessments amounting to $29,576, were levied which, with smaller receipts, gave a total of $92,624. Disbursements were $92,624. It has been the management's policy to keep up operations as long as expenses were met, so as to prospect for ore of a better grade. A total of 2427 ft. of development was done, the work being confined to the 800-, 850-, and 940-ft. levels. Most of the ore came from the vein on the latter level four to five feet wide and 145 ft. long. A new four-drill electric compressor has recently been installed in connection with the electric station pump on the 940-ft. level.

Chief—A third 150-hp. boiler has been installed, thus affording a total capacity of 450 hp. Shipments for the week ended Sept. 27 amounted to 23 cars.

Dragon Consolidated—Shipments of iron ore will be resumed, so as to provide funds for continuing development south of the Iron Blossom in search of silver, lead and copper ores.

Mammoth—A dividend of 15c. per share, or $60,000, has been declared, bringing the total of dividends paid by this company up to $2,250,000. The output for the week ended Sept. 27 was 18 cars.

Salt Lake County

Utah Consolidated—At the end of 1911, there was 23,785 tons of lead ore in sight, averaging 15.44% lead, 3.01 oz. silver, 1.04% copper, with some gold, and 12,000 tons of concentrating ore carrying 6.8% lead, 0.35 oz. silver, 1.04% copper, with some gold. The output of copper ore for the first six months of 1912 was 100,808 tons, however, as compared to 162,522 tons for the whole of the year preceding, showing a largely increased production, much new copper ore being developed at the same time, and the tonnage of lead ore in sight being slightly increased.

Columbus Consolidated—This company recently shipped 34 tons of concentrates from its mill, which has been operating during the summer. There are rumors of a proposed consolidation between this company and the Columbus Extension adjoining.

Michigan-Utah—The new tramline is bringing down ore, which has accumulated.

Summit County

Park City shipments for the week ended Sept. 28 were 2,500,700 lb., the shippers being the Daly West, Daly-Judge, Silver King Coalition, New York Bonanza, Little Bell, Barry-Coxe.

Thompson-Quincy—Drifting is being done by the Daly West company from the 900-ft. level toward the limestone-quartzite in the Thompson-Quincy, where ore was recently discovered. The drift will be 900 ft. long, and has 800 ft. more to go. It is progressing at the rate of 10 ft. daily. The work will afford better facilities for the development and extrac-

tion of ore, improve drainage and furnish better air in both properties, as well as opening up new ground in the Daly West.

Revelator Consolidated Mining Co.—The two John The Revelator claims and the West St. Louis are to be consolidated under this name. The new company is to be capitalized for 600,000 shares par value 50c., 100,000 shares to remain in the treasury. The claims are near the summit of the divide between the Snake Creek and Bonanza Flat sections. The Revelator claims have been developed by means of a tunnel and 147-ft. incline. There is a body of ore at the bottom of the incline, from which shipments of good-grade ore carrying lead, silver, and gold have been made during the year. A tunnel will be driven by the new company to develop this ore at depth.

Washington

Ferry County

Surprise—Extensive operations are being carried on at this mine, owned by the Republic Mines Corporation, Republic. The ore is of excellent grade and is being treated in the company's mill.

Stevens County

Iron Gap—Preparations are being made for developing this mine by L. D. Peters and associates, of Chewelah, owners.

Wisconsin

Platteville District

Three local drilling companies were recently organized at Platteville to develop the Hibernia lease just north of the city and the Goke and Schroeder farms four miles south of the city adjacent to the Cruson mine.

East End—At the end of the first week's milling this new property is turning out $1000 worth of ore per day, making 18 tons of zinc and three tons of lead concentrates in eight hours, the zinc concentrates assaying over 50% zinc. The property was recently bought by the Wisconsin Zinc Co. for $75,000.

Gruno—This company, at Mifflin, is sinking a new shaft on the Bainbridge land.

Tripoli—This company, at Mineral Point, has made a valuable discovery on the old range half a mile from the mill and is making a connection by tramway. The mine is an old producer but has been idle for several years.

M. & D.—This company, at Cuba City, has struck the Jarrett range again by churn drilling and will re-open the mine.

Cleveland Mining Co.—This company has taken over the Midway and Henrietta leases near Cuba City; both are equipped with concentrating plants which have been idle for several years.

Wyoming

Albany County

Utopia—Preparations are being made for active work at this mine west of Centennial. The lower tunnel is now in ore of fair grade and it is expected that shipments of ore can be made soon.

Free Gold—This property is under option to the American Mineral Development Co. Some high-grade ore is being taken out.

Carbon County

Four properties in the Snowy Range district are now shipping ore and from six others ore is being mined that can be milled or concentrated at a profit. The shippers are the Fram, Klondike, Cable and Switzerland. The first three are owned by Class, Stewart and Smelzer; the Switzerland is owned by these men and Charles Olsen. A four-foot vein has been opened on the Cable claim and assays of the ore range between $50 and $150 in gold. Much silver-lead ore carrying gold, has been found in this region.

Canada

British Columbia

Consolidated Mining & Smelting Co.—The concentrator at the Le Roi mine, in the Rossland district, recently fitted with a 30-ton Elmore oil-vacuum process unit to treat experimentally the siliceous ores of the Le Roi mine, is now running.

Nova Scotia

Nova Scotia Steel & Coal Co.—The output for September was; coal mined, 67,889 tons; coal shipped, 87,789; pig iron, 7490; steel ingots, 6722; iron ore mined, 57,913; iron ore shipped, 61,800 tons.

Dominion Coal Co.—The output for September was approximately 380,000 tons. At the present rate of production the total output for the year will be 4,500,000 tons.

Ontario—Cobalt

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Oct. 4, and for the year to date, were:

Bailey	21.57	21.57
Beaver	24.26	299.38
Buffalo	61.81	926.38
Casey Cobalt	.....	212.15
City of Cobalt	.....	887.99
Cobalt Lake	.....	683.45
Cobalt Townsite	29.00	1,384.95
Chamb.-Ferland	.....	362.33
Coniagas	158.54	1,673.95
Crown Reserve	17.56	368.66
Drummond	.....	383.05
Hudson Bay	.....	538.47
Kerr Lake	.....	560.22
La Rose	76.85	2,732.88
Lost and Found	.....	15.00
McKinley-Darragh	.....	1,963.78
Nipissing	.....	1,704.50
O'Brien	43.23	496.54
Penn.-Canadian	.....	29.70
Provincial	.....	22.22
Right of Way	.....	242.82
Timiskaming	66.75	863.76
Trethewey	.....	381.54
Wettlaufer	.....	265.74
Colonial	.....	63.14
Dominion Reduction Co	.....	56.64
Totals	499.57	17,140.81

Four claims staked by Jordan and Bruce in the Gillies Limit have been sold to Frank M. Perry, of Toronto.

Kerr Lake—Reserves are estimated at a total of 6,660,091 oz. of silver. Of this, 2,829,100 oz. is in the form of high-grade mine ore, 1,490,561 oz. in mill and dump ore. The rest, 2,781,400 oz. is under the lake and not at present available.

King Edward—H. E. Jackman who has a lease on this property, is making arrangements to resume work.

Crown Reserve—In crosscutting north from No. 24 vein on the 150-ft. level a new vein has been struck, at approximately 800 ft. from the shaft. The vein has never been encountered on any of the other workings and contains high-grade ore. The crosscut will be continued in the hope of finding other veins.

Bruce—On these locations, which adjoin the Mann properties in the Gowganda district, a good vein carrying native silver was uncovered Sept. 28. A Buffalo syndicate headed by A. M. Sechrest, has bought a controlling interest in the property and will shortly begin development.

Ontario-Porcupine

Crown Chartered—Pending the result of the special stockholders' meeting, the mine has been closed and the pumps taken out, with the result that the underground workings are flooded. The affairs of the company appear to be practically settled by an agreement whereby Messrs. Henault and Heffernan agree to do their part in the reorganization by taking stock at 25c. per share to liquidate their claim of $140,000. The old board of directors will also resign and a new board will be elected.

Porcupine Townsite—The power plant is nearing completion. The underground operations which will have to be carried on largely under the lake, will soon be started.

Plenaurum—A good discovery is stated to have been made near the line between this property and the Jupiter.

Dome Lake—The ore encountered on the 180-ft. level is richer than was indicated by the diamond-drill cores.

Boissoneault—These claims, in the new district of Gauthier, which lies northwest of Swastika, are under option to a Montreal syndicate for $150,000. The ore consists of small quartz stringers in a quartzite formation. Many of these stringers show free gold, but a great amount of work will be necessary before any idea of the value of the property can be obtained.

Asia

Chosen

Oriental Consolidated Mining Co.—The cleanup for September is $122,000, according to manager's cable dispatch.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Oct. 9—Coal-trade conditions are practically unchanged. Business in the West is active and strong. Car shortage and slow transportation are the only limiting factors. The same state of affairs exists in the seaboard bituminous trade. The West Virginia strike also is still a disturbing element.

The anthracite trade is still much behind on orders, but is gradually catching up. There is no occasion for the scare which some of the dealers in Eastern cities are trying to work up among consumers.

The Pennsylvania Railroad Commission has decided to investigate the rates charged on anthracite to Philadelphia, on complaints made that such rates are unreasonable and discriminatory.

Anthracite shipments in September fell below those for August, being 5,876,406 long tons. For the nine months ended Sept. 30, the total was 51,376,379 long tons in 1911, and 44,835,219 in 1912; a decrease of 6,541,160 tons, or 12.7%, this year.

British Coal Trade—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, eight months ended Aug. 31, long tons:

	1911	1912	Changes
Coal	41,831,040	39,672,864	D. 2,158,176
Coke	617,294	583,034	D. 34,260
Briquettes	1,117,783	990,258	D. 127,525
Total exports	43,566,117	41,246,156	D. 2,319,966
Steamer coal	12,665,440	11,608,744	D. 1,056,691
Total	56,231,557	52,854,900	D. 3,376,657

Imports of coal for the eight months were 16,147 tons in 1911, and 181,721 in 1912; increase, 165,574 tons.

Iron Trade Review

New York, Oct. 9—The general activity of the market continues, specifications on contracts and new orders coming in freely. Prices are firm and here and there have been advanced, the general tendency being upward.

It is almost the general expectation that there will be a shortage of material all along the line this winter, with a car shortage predicted at the same time. It is claimed that the large steel interests are endeavoring to prevent a runaway market, and that what is being done is straight business, without any speculation on the part of buyers, but the number of those who doubt such claims is growing from week to week.

Reports that the Pittsburgh mills have made a straight advance of $1 a ton on bars, plates and shapes, under date of Oct. 5, cannot be confirmed from the mills themselves. It is observed, however, that they are accepting less business in bars at 1.35c. and that the price of 1.40c. on plates and shapes has disappeared entirely, the Steel Corporation having been the only seller really quoting this figure for a fortnight or more. It appears that the mills wish to minimize the importance of market advances, and as it is a sellers' market entirely they are treating each inquiry on its particular merits, covering their regular customers and turning down other business. An exception should be made of the smaller plate mills, which do not make contracts, and are now selling plates at prices ranging from 1.60c. on up to perhaps 2.00c. for early delivery.

Based on the rate specifications as now being received on this year's contracts, and the contracting that has been done for first quarter, the mills as a rule are sold up through first quarter, and pretty well into second quarter. Any serious disturbance in trade, of course, would shut off business now considered as certain to be specified, and change the aspect of affairs, but it can still be said that the mills have a larger tonnage of absolutely sound business on their books than ever before.

The pig-iron market again shows much strength and advancing prices. More merchant furnaces are going into blast, but the question of ore and coke supplies is quite a serious one.

Complaints continue to come in of scarcity of labor at various points; also of slow railroad transportation, which delays the deliveries on contracts.

Pig Iron Production—The blast furnace statistics collected by the *Iron Trade Review* show that on Oct. 1 there were 261 coke and anthracite stacks in blast; an increase of seven over Sept. 1. Making allowance for the charcoal furnaces, the estimated production of pig iron in the United States in September was 2,463,800 long tons; for the nine months ended Sept. 30 it was 21,512,425 tons. Of this total approximately 15,856,400 tons, or 73.7%, were made by stacks owned and operated by steel works.

Baltimore

Oct. 7—Exports for the week included 2,241,100 lb. steel rails and 455,252 lb. miscellaneous iron and steel to Cuba; 8,016,814 lb. miscellaneous iron and steel to Panama; 867,300 lb. pipe to Antwerp; 1490 lb. selenium and 57,200 lb. iron pipe to Hamburg. Imports included 5937 tons pyrites from Huelva, Spain; 22,700 tons iron ore from Cuba.

Birmingham

Oct. 7—Pig-iron prices in Southern territory have advanced to $14 per ton, No. 2 foundry, as a minimum, delivery either during the last quarter of this year or the first three months of 1913. Furnace companies are not showing any willingness to sell beyond the first quarter though it is reported that $15 per ton might tempt trading. There is still much apprehension on the part of consumers because of the railroad car shortage and immediate delivery on old orders is being requested. In some instances furnace companies have come to the assistance of other companies by supplying the trade. One or two companies are still out of the market on certain grades of iron while others are selling very carefully on lower grades because of the large quantity already sold. The cast-iron pipe manufacturers are melting more iron right now than at any time heretofore. There will be no interruption whatever in the pipe make this winter.

A few shipments of pig iron from this section on foreign orders are still to be noted. With ocean freights at command, it is stated that considerable more foreign business could be booked.

Steel activities are unchanged. The car shortage has been felt at the steel plants at Ensley and Gadsden. Some shipments have been delayed.

The strike of the iron molders for shorter hours and better wages is still felt at several of the shops in this district.

Cleveland

Oct. 7—Wild boats for ore are still in demand, 10 or 15c. over contract rates being paid.

Pig Iron—The market is active and orders are coming in freely. Prices are again firmer and some desirable brands have been advanced. Current quotations, Cleveland delivery, are $15.90@16.40 for bessemer, $16@16.50 for No. 2 foundry, and $19.55 for Jackson County silvery.

Finished Material—Quotations are firm on all lines. Buyers are urging deliveries as much as possible.

Chicago

Oct. 8—The iron market continues firm, with the demand large for finished materials and pig iron selling in small but widely distributed lots. Few melters are figuring now on large requirements; the tendency is toward holding off as at frequent periods in the last year. Yet a fair aggregate tonnage is being sold each week, chiefly for needs within the first half. An occasional sale is made to piece out requirements of the last quarter.

Northern No. 2 foundry iron brings $17@17.50, at the furnace, which means about $17.50@18, Chicago. Southern of corresponding grade sells for $13.50@14, Birmingham, which means $17.85@18.35, Chicago. Some furnace agents hold out firmly for the higher prices named and perhaps the greater part of the iron sold is at their figures. Lake Superior charcoal iron brings $18.75@19.25, Chicago, and is in very good demand.

The market for finished products is active, contracts for first-half needs being freely made in nearly all lines, and the demand being strong. Rail contracts are large and the demand for all lines of railroad supplies is large. Structural material is steadily in demand for construction work over a large territory and contracts for delivery are held back by the difficulty of forcing a greater output. Bars are actively in demand and prices are strong, bar iron bringing 1.50c. and soft-steel bars 1.53c.; contracts are being made freely for first-quarter needs. Plates and sheets are in very good demand and minor lines show activity, the whole situation being one of great strength.

Philadelphia

Oct. 9—The pig-iron market continues active. Material for fourth-quarter delivery is scarce, and stocks have practically disappeared. Pipe makers are picking up their grades of iron wherever they can find them. No. 2 X foundry is quoted at $17.25@17.40; gray forge at $16.50@16.75. Basic is still in demand and $16.50@17 is quoted. With an unusually good demand $21.50@22 has been paid for low phosphorus iron.

Billets—The market is bare of open-hearth billets for early delivery. Some first-quarter business has been taken at $28, with $32 for forging billets.

Bars—Iron bars are in demand and 1.45@1.50c. at mill is now quoted. Steel bars are unchanged.

Sheets—Sheets are strong at the higher prices. It is hard to get early deliveries.

Plates—Demand continues heavy and people who want early delivery have to sit down and wait.

Structural Material—No large business has been placed this week, but some big orders are in sight. Mills are not hunting business, having all they want for the present.

Pipes and Tubes—Continued activity is reported, and early deliveries call for premiums.

Scrap—Heavy steel-melting scrap is a little slow, but other kinds are in demand. Dealers are picking up all they can get.

Pittsburgh

Oct. 8—Throughout the iron and steel market the news indicates greater activity and a stronger tone. Buying of finished steel products for next year is now on a large scale, particularly in bars, plates, shapes and sheets. In bars, plates and shapes quotations are advancing, 1.40c. having disappeared entirely as to plates and shapes, leaving the market at 1.45c. for plates and shapes and 1.35c. for bars. These are minimum prices, with considerable tonnage being placed at $1 a ton higher. The most strenuous times, however, are in cruder materials, unfinished steel, pig iron and coke. Consumers are scouring the country for billets and sheet bars for this year's delivery, and paying almost any price to secure deliveries. Steel-making iron has advanced sharply again, with free buying for first-quarter delivery, and at new high prices, $16.25, Valley, for basic and $17 for bessemer. Connellsville furnace coke for prompt shipment has sold at $3.25, ovens, a total advance of a full dollar a ton in 60 days, and the market shows signs of going still higher.

Pig Iron—Bessemer has advanced 50c., there having been sales of 25,000 tons, 1000 tons and 750 tons at $17, Valley, chiefly for first-quarter delivery. Basic has sold above $16; last week's price, 5000 tons at $16.10 and afterward 10,000 tons at $16.25, at which the market is now quotable. A large steel plant which has not lately been a buyer has figured prominently in these transactions. The Standard Sanitary Manufacturing Co. has purchased about 15,000 tons for first quarter and 10,000 tons for second quarter, of foundry and forge grades for its Allegheny and New Brighton plants, paying on the basis of $16 at furnace for No. 2, which has lately been the minimum of the market. It has also bought southern iron for its Louisville plant, paying on the basis of $14, Birmingham. Alice furnace at Sharpsville, Penn., went into blast last week, Sharpsville furnace at the same point went in yesterday and Ella at West Middlesex will go in before the close of the week, the first named on basic, the other two on bessemer. We quote: Bessemer, $17; basic, $16.25; No. 2 foundry, $16; malleable, $15.50@16; gray forge, $15.50, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—English makers who were quoting $56.50, Baltimore, on contract have advanced to $61, while those who had previously advanced to $59.50 hold this quotation, and we therefore quote the contract market at $59.50@61, Baltimore, with freight to Pittsburgh $1.95; and prompt at $61@65, Baltimore.

Steel—The market is practically bare of material for this year, while for next year mills are not yet making any quotations. Consumers are inquiring for small or large lots for early delivery and some of them seem ready to pay almost any prices. We repeat last week's quotations, although they are largely nominal: Bessemer billets, $25; bessemer sheet bars, $25.50; openhearth billets, $26; openhearth sheet bars, $26.50; forging billets, $32. Rods are quotable $1 higher, at $28@29 at mill.

Sheets—This morning the American Sheet & Tin Plate Co. advanced its price on blue annealed sheets $1 a ton, or from 1.55c. to 1.60c. Several of the independent mills had already been quoting 1.60c., being able to make somewhat earlier delivery than the leading interest. At 1.55c. a considerable tonnage has been sold for first quarter. Black and galvanized sheets have been moving freely for that delivery, but some of the independent mills are practically refusing to sell, being amply filled for this year and expecting an advance before they need to sell for next year. Premiums are frequently obtained for early delivery. We quote: Blue annealed, 10 gage, 1.60@1.65c.; black, 28 gage, 2.15@2.25c.; galvanized, 28 gage, 3.30@3.40c.; painted corrugated, 2.35c.; galvanized corrugated, 3.35c. per pound.

St. Louis

Oct. 7—There has been an increase in demand and inquiry, with good sales and advancing prices. Southern No. 2 foundry is selling up to $14, Birmingham, or $17.75, St. Louis, though some sales at $13.75, furnace, are reported. Northern No. 2 brings $17.75, with $18 asked on first quarter. Business in finished iron and steel is active.

Coke is again higher and irregular, with early deliveries hard to get.

Iron Ore Trade

Notwithstanding some drawbacks to navigation, the movement of iron ore down the Lakes in September reached a total of 7,287,230 tons. The total movement for the season to Oct. 1 was 24,837,137 tons in 1911, and 36,338,382 in 1912; an increase of 11,501,245 tons, or 46.3%, this year.

British Ore Trade—Imports of iron and manganese ores in Great Britain, eight months ended Aug. 31, long tons:

	1911	1912	Changes
Iron ore	4,526,377	4,335,025	D. 190,352
Manganese	262,267	211,762	D. 50,505

German Foreign Trade—Imports and exports of ores in Germany seven months ended July 31, metric tons:

	Imports	Exports	Excess
Iron ore.....	6,862,749	1,320,444	Imp. 5,542,305
Manga'se ore	257,576	5,910	Imp. 251,666

Imports of iron ore are chiefly from Sweden and Spain. Exports are chiefly of minette ores from Luxemburg to France and Belgium.

Foreign Iron Trade

British Foreign Trade—Exports and imports of iron and steel and of machinery in Great Britain, eight months ended Aug. 31, as valued by the Board of Trade returns:

	Exports	Imports	Excess
Iron and steel	£29,896,894	£8,062,227	Ex. £21,834,667
Machinery...	21,181,719	4,506,817	Ex. 16,674,902
Hardw're, etc.	7,912,086	5,230,430	Ex. 2,681,656
New ships....	3,712,249	.....	Ex. 3,712,249
Total..... ..	£62,702,948	£17,799,474	Ex. £44,903,474
Total, 1911..	59,259,286	15,549,318	Ex. 43,709,968

Increase in exports, £3,443,662; increase in imports, £2,250,156. The quantities of iron and steel were, in long tons:

	1911	1912	Changes
Exports	1,168,164	1,251,716	I. 154,036
Imports	1,168,164	1,251,716	I. 83,552

Exports of tinplates to the United States decreased from 12,554 tons in 1911 to 1163 tons this year.

German Foreign Trade—Exports and imports of iron and steel and of machinery in the German Empire, eight months ended Aug. 31, metric tons:

	Exports	Imports	Excess
Iron and steel..	3,890,500	446,632	Exp. 3,443,868
Machinery.....	329,567	58,726	Exp. 270,841
Total.....	4,220,067	505,358	Exp. 3,714,709
Total, 1911.....	3,769,306	452,302	Exp. 3,317,004

Increase in exports 450,761 tons, or 12%; increase in imports, 53,056 tons, or 11.7%, this year.

Metal Markets

New York, Oct. 9—The metal markets continue active and generally strong.

MONTHLY INDEX NUMBERS

Month	1911	1912	Month	1911	1912
January....	110	111	July.....	112	114
February ..	115	109	August.....	117	120
March.....	112	111	September.	111	127
April.....	114	115	October	112	.....
May.....	118	118	November .	111	.....
June.....	115	117	December..	110	.....

Year 1909, 115; 1910, 115; 1911, 112.
Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Gold, Silver and Platinum

Gold—The price of gold on the open market in London remains at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. The movement from London to New York has temporarily ceased. The Bank of France is reported to be hoarding gold on account of the disturbed political situation.

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Aug. 1912..	$ 2,498,472	$ 5,576,900	Imp. $3,078,428
" 1911..	480,799	4,105,331	Imp. 3,624,532
Year 1912..	43,159,972	34,589,111	Exp. 8,570,861
" 1911..	15,910,449	40,473,010	Imp. 24,562,561
Silver			
Aug. 1912..	5,574,644	3,952,279	Exp. 1,622,365
" 1911..	4,869,359	3,653,329	Exp. 1,216,030
Year 1912..	45,834,920	32,652,869	Exp. 13,182,051
" 1911..	44,587,570	29,534,724	Exp. 15,052,846

Exports from the port of New York, week ended Oct. 5: Gold, $150,190, largely to Panama; silver, $1,168,875, chiefly to London. Imports: Gold, $315,225, from Mexico, South America and Australia; silver, $210,337, mostly from Central America.

Platinum—Business is good and the market is reported firm both here and abroad. Dealers here continue to ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, up to 10% iridium.

Our Russian correspondent writes under date of Sept. 26, that the market and the prices remain generally unchanged. The demand for considerable quantities of platinum became higher, but business has not been closed. From Ekaterinburg it is reported the area of the platinum mines has largely increased in comparison with last year. A large stock of platinum is in the hands of speculators, but they are buying the metal offered by the starateli. The quotations are: In St. Petersburg, 37,300@37,500 rubles per pood; at Ekaterinburg, 9.80 rubles per zolotnik; for crude metal, 83% platinum —equivalent to $36.65 and $36.85, respectively.

Iridium—The supply of this metal appears to be short, and prices have advanced sharply. The present quotations are $67.50@70 per oz., New York.

Silver—The market continues steady with only slight variations. There does not seem to be any important change in sight at present. The announcement of the China loan for £10,000,000 imparted strength to the market at the time, and it continues steady at 29½ to 29 5/16d. in London.

SILVER AND STERLING EXCHANGE

Oct.	3	4	5	7	8	9
New York....	63 3/4	64	64 1/4	64	64 1/4	63 3/4
London ...	29 1/2	29 5/16	29 5/16	29 5/16	29 5/16	29 1/2
Sterling Ex..	4.8555	4.8555	4.8550	4.8535	4.8545	4.8560

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Sept. 26, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India.....	£6,062,800	£7,551,200	I. £1,488,400
China.....	989,700	933,500	D. 56,200
Total.....	£7,052,500	£8,484,700	I. £1,432,200

The Indian currency return of Sept. 24 shows a decrease of 22 lakhs of rupees in coin held, but an increase of 58 lakhs in silver bullion under coinage.

Gold in the United States Oct. 1, as estimated by the Treasury Department: Coin and bullion held by Treasury against gold certificates outstanding, $1,065,408,169; gold coin in Treasury, $166,063,940; in banks and circulation, $609,910,326; total, $1,841,382,435; an increase of $8,298,871 during September.

Sales of gold bars by the New York Assay Office for use in the arts amounted to $2,673,008 in September.

Copper, Tin, Lead and Zinc

NEW YORK

Oct.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
3	17 5/8 @17 3/4	17.40 17.50	50 1/8	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
4	17 5/8 @17 3/4	17.40 17.50	50 1/8	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
5	17 5/8 @17 3/4	17.40 17.50	50 1/8	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
7	17 5/8 @17 3/4	17.35 17.45	50 1/8	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
8	17 5/8 @17 3/4	17.30 17.40	49 3/4	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
9	17 5/8 @17 3/4	17.30 17.40	50	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market has been extraordinarily dull, demand either from Europe or from manufacturers at home having been inconsequential. The Balkan trouble appears to have disturbed business abroad, while on this side the statistics published on Tuesday showed that manufacturers had previously overbought. The statistics were unfavorably received. Even the producers admitted that they killed any idea of an advance in price. The larger agencies are still holding at the peg price of 17¾c., delivered, etc., but others have offered freely at 17⅝c. and that price could be shaded materially.

LONDON

Oct.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
3	78¼	79¼	83⅛	229¼	228	21⅛	27⅛
4	78	79	83⅛	230	228¾	21⅛	27⅛
5	....	....	....	.....	.....	....	....
7	77 11/16	78⅛	83	228½	227¼	21⅛	27⅛
8	77⅛	78 3/16	83	227¼	226	21⅛	27⅛
9	77⅛	78⅛	82½	228½	227½	21⅛	27⅛

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

The supply of Lake copper being more narrowly held, there are not yet any cheap offerings of this kind and the market is nominal.

At the close, Lake copper is quoted 17⅝@17⅞c.; electrolytic in cakes, wirebars or ingots 17.30@17.40c.; casting copper is quoted nominally at 17.20@17.25c. as an average for the week.

The standard market has been quiet and weakish, due principally to the Balkan disturbance, which caused some rather heavy selling of Rio Tinto shares. On Oct. 3, spot was £78 5s. and three months £79 5s. On Oct. 4, both positions were 5s. lower. On Oct. 7 spot was down to £77 13s. 9d. three months to £78 12s. 6d. The market closes on Oct. 9 at £77 2s. 6d. for spot and £78 2s. 6d. for three months.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼ base, carload lots at mill.

Copper exports from New York for the week were 6453 long tons. Our special correspondent gives the exports from Baltimore at 2865 tons for the week.

Tin—The London market which moved in a desultory fashion during the past week, became firmer at the end of last week, only to decline again the beginning of this week. The reason for these fluctuations is to be found solely in speculative operations, as no developments became known that might otherwise account for it. The market again closes firmer at £228 10s. for spot and £227 10s. for three months.

No change has been noticed in the attitude of domestic consumers, who, in accordance with their requirements, have purchased prompt material somewhat more liberally. They were so much better able to do this, as the premium for spot tin has disappeared, due to large shipments from London, which are on the way. There was also some material sold at below the importation point by second hands, who were anxious to liquidate their holdings. The market closes steady at 50c. for October.

Straits shipments of tin in September are cabled at 5440 tons, an increase of 322 tons over last year.

Lead—The market is unchanged with a fair business doing at last prices, 5.10c., New York, and 4.90@4.95c., St. Louis.

The London market is somewhat firmer, and at the close Spanish lead is quoted £21 7s. 6d. with English lead 2s. 6d. higher.

Spelter—The market is unchanged. There is a fair demand, but buyers have covered their near-by wants and are not disposed to buy ahead; on the other hand, there is no particular pressure to sell. St. Louis is quoted 7.30@7.35c.; New York, 7.45@7.50 cents.

The London market is slightly firmer, good ordinaries being quoted £27 12s. 6d., specials £27, 17s. 6d. per ton.

Base price of zinc sheets is $9 per 100 lb., f.o.b., La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted 7¾c. per lb., New York.

Other Metals

Aluminum—Business is active but prices have been variable. We quote 25@26c. per lb. for No. 1 ingots, New York. The foreign market is firm.

Antimony—Demand is good and the market is active. Prices are firmer, Cookson's being quoted at 10@10¼c. per lb.; Hallett's at 9¼@9½c.; while 9@9¼c. is named for Hungarian, Chinese and other outside brands.

Quicksilver—The market is steady, and prices here are unchanged. New York quotations are $42 per flask of 75 lb., with 60c. per lb. for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. The London price is £8 per flask, with £7 17s. 6d. quoted from second hands.

Nickel—Shot, blocks, plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 5—The high price of zinc sulphide ore was $65, the base per ton of 60% zinc $57@62. Zinc silicate was $32@36 per ton of 40% zinc, with greater competition. The average price, all grades of zinc, $58.02. Lead ore sold up to $68, on a base of $64@66 per ton of 80% lead, the high level of prices being maintained on the recently adopted plan of buying on the net weight of the metal contents. The average price, all grades of lead, is $65.22 per ton.

During the past month the reserve stock, though practically unchanged around 3000 tons, has been changed from ore purchased in advance to ore held for higher prices, since the weaker tendency of the ore market has been manifested. The high average price of the week on zinc ore is occasioned by the strong prices of silicate, a large part of which sold up to $40 per ton.

SHIPMENTS WEEK ENDED OCT. 5

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,240,060	.....	940,580	$157,299
Joplin	2,879,180	.....	357,020	101,680
Galena	1,457,840	.....	122,970	49,128
Alba-Neck	1,023,210	.....	.....	31,719
Duenweg	988,990	.....	60,870	31,616
Granby	229,000	976,210	8,740	25,740
Cave Springs	536,300	.....	.....	17,160
Oronogo	449,270	.....	63,420	13,674
Jackson	455,520	.....	.....	13,665
Miami	353,930	.....	85,970	12,660
Spurgeon	118,860	392,540	.....	10,393
Springfield	324,910	.....	.....	10,325
Carl Junction	248,690	.....	9,720	8,390
Wentworth	127,200	104,510	.....	5,337
Carthage	124,980	.....	.....	3,498
Quapaw	124,400	.....	.....	3,483
Aurora	.....	188,270	.....	3,390
Sarcoxie	120,600	.....	.....	3,376
Totals	13,802,940	1,661,530	1,649,290	$502,533
40 weeks	426,561,300	27,262,520	71,676,430	$13,787,745

Blende val., the week, $416,888; 40 weeks, $11,337,437
Calamine, the week, 31,851; 40 weeks, 427,428
Lead value, the week, 53,794; 40 weeks, 2,022,880

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	59.75	41.29	57.07	59.33	61.26
October	42.38	.....	40.89	.....	54.72	.....
November	45.40	.....	43.25	.....	57.19	.....
December	44.13	.....	40.76	.....	62.03	.....
Year	$41.45	.....	$39.90	.....	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Oct. 5—The base price paid this week for 60% zinc ore declined from $62 to $58. The base price paid for 80% lead ore was $62@64 per ton.

SHIPMENTS WEEK ENDED OCT. 5

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	670,900	.....	272,500
Mineral Point	662,200	.....	.....
Galena	453,900	.....	.....
Benton	429,200	.....	425,000
Hazel Green	340,000	.....	.....
Shullsburg	316,000	66,000	.....
Highland	262,600	.....	.....
Cuba City	160,000	81,000	297,940
Harker	85,860	.....	.....
Rewey	84,000	.....	.....
Montfort	74,000	.....	.....
Linden	60,080	.....	.....
Total	3,598,740	147,000	995,440
Year to date	155,237,550	6,351,660	27,210,650

Shipped during week to separating plants, 1,789,880 lb. zinc ore.

Other Ore Markets

Tungsten Ore—Ferberite, wolframite and huebnerite ores, $6.50@7 per unit per ton of 2000 lb. of ore containing 60% of tungsten trioxide. For scheelite ore, 50c.@$1.50 per unit less. These prices are delivered.

Zinc Ores—For Rocky Mountain blende of good quality, especially as to iron and lead contents, the current price, delivered at smelting works in Kansas and Oklahoma, is for the zinc contents, less eight units at the St. Louis price for spelter; with a deduction of $16 to $18 per 2000 lb. of ore.

Ferro-alloys—The Primos Chemical Co. has rebuilt the recently burned portion of its works at Primos, Delaware County, Penn., and the plant is in full operation again. It was entirely rebuilt of brick and iron and is fireproof. This company manufactures tungsten, molybdenum, ferrovanadium, ferrotungsten and ferromolybdenum.

Chemicals

New York, Oct. 9—Increasing activity begins to be apparent in the general market and business is in fair shape.

Arsenic—The market is firm. Spot arsenic is scarce, though more Mexican deliveries are promised. Quotations are $5@5.12½ per 100 lb. for spot and nearby deliveries. Futures are quoted at $4.50, but are rather neglected.

Copper Sulphate—Business is good and sales are increasing. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is steady. Quotations are 2.55c. per lb. for spot and November; 2.57½c. for later deliveries.

Petroleum

The monthly statement of the *Oil City Derrick* gives the following statement of oil wells completed in September, not including California: New York, Pennsylvania and West Virginia, 545; Lima-Indiana, 78; Kentucky, 39; Illinois, 105; Kansas-Oklahoma, 628; Texas-Louisiana, 83. In all the divisions there were 1479 wells completed with a new production of 48,613 bbl. Of the completions 251 were failures and 147 were gas wells. The total number of oil producing wells was 1081 against 1272 in August, 1092 in July, 1148 in June and 981 in May. There were 46 fewer wells completed in September than in August, but the production was 919 bbl. more than in the previous report. This increase comes wholly from the Gulf Coast districts, where the production was practically doubled.

At the close of August there were 562 rigs up and 1370 wells drilling, an increase of 75 rigs and a decrease of 41 drilling wells.

Mining Stocks

New York, Oct. 9—On Oct. 3, the Exchange was much more active and prices advanced. On the Curb, coppers were rather quiet, but firm. The feature in other mining stocks was Tonopah Merger, of which 74,700 shares were sold at advancing prices.

Oct. 4 there was some weakness developed on the Exchange, in sympathy with the European markets. On the Curb there were heavy sales of Tonopah Merger, Butte & New York and Diamond Black Butte. The copper stocks were irregular, both as to demand and prices.

Aug. 5 the Exchange was depressed by some heavy sales of stocks for foreign account, but quickly recovered. On the Curb the Cobalt stocks were firm, and there was a fair demand for other mining stocks. Coppers were irregular.

Oct. 7 the Exchange was still heavy and had not taken up the large quantity of stocks offered. The Curb was more active with good business in the Cobalts and the Nevada gold stocks. Coppers were rather weak.

Oct. 8 and 9 the Exchange was irregular and dealings were rather small. The Curb was more active, sales of mining stocks being fairly large. Cobalts and gold stocks gained, and copper shares showed only small changes in price.

Boston, Oct. 8—Despite the fact that the Copper Producers' figures showed an increase of stocks in September, stock-market prices maintained a firm tone, although the present market is one of specialties. A report, although not authenticated, is that there is to be a merger of some of the Butte mines. North Butte's action in the market reflects this, although at the same time reports from the property state that the richest ore ever encountered is now being mined at depth.

The price of North Butte is up $6.25 for the week to $39.50, which would indicate that there was something in the wind out of the ordinary. In this connection East Butte is mentioned and the price of this specialty has risen $1.62½ to $16.87½. It is known that there is something brewing in this company's affairs, but nothing definite has come out as yet.

Granby is another stock which is prominent. The price has risen $6.50 to $64.50. The annual report was a favorable document, and it is only a short time before it is believed that dividends will be resumed. The so-called Dow stocks, although not active, are firm. Committees of Stock Exchange members, as well as of stockholders of these companies, are probing into the acts of the late president, S. R. Dow.

Prices on the Curb have been firm in the main, but activity is in spots. Alaska Gold touched $10.25, but is slightly

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	July	August	Sept.
Alaska shipments	2,224,441	1,242,836	1,726,715
Anaconda	23,000,000	25,250,000	24,500,000
Arizona, Ltd.	3,200,000	3,260,000	3,340,000
Copper Queen	7,708,147	8,040,424	9,102,861
Calumet & Ariz.	4,748,000	4,514,000	4,462,000
Chino	2,945,000	3,437,309	3,372,369
Detroit	2,194,090	1,882,289	1,881,668
East Butte	1,261,304	1,410,500	1,250,000
Mammoth	1,818,738	1,802,590	.....
Mason Valley	1,500,000	.....	.....
Nevada Con.	6,024,274	.....	.....
Ohio	617,500	.....	.....
Old Dominion	2,543,763	2,597,896	2,223,000
Ray	2,985,965	2,888,095	.....
Shannon	1,446,000	1,400,000	1,142,000
South Utah	142,555	224,855	.....
United Verde*	2,500,000	2,500,000	.....
Utah Copper Co.	10,602,000	11,248,992	.....
Lake Superior*	19,500,000	21,000,000	.....
Non-rep. mines*	8,970,000	8,970,000	.....
Total production	105,991,687	.....	.....
Imports, bars, etc.	25,586,735	.....	.....
Total blister	131,578,422	.....	.....
Imp. in ore & matte	7,748,392	.....	.....
Total American	139,326,814	.....	.....
Miami†	3,027,710	3,048,750	2,949,150
Brit. Col. Cos.:			
British Col. Copper	1,026,000	941,364	.....
Granby	1,802,753	1,970,388	.....
Mexican Cos.:			
Boleo†	2,386,480	.....	.....
Cananea	4,000,000	4,044,000	3,500,000
Moctezuma	3,094,016	3,229,839	771,844
Other Foreign:			
Cape Cop., S. Africa	.....	.....	.....
Kyshtim, Russia	1,325,000	.....	.....
Spassky, Russia	795,200	902,720	.....
Famatina, Argen.	.....	.....	.....
Tilt Cove, Newf'd.	.....	.....	.....
Exports from:			
Chile	8,960,000	8,512,000	.....
Australia	8,288,000	8,064,000	.....
Arrivals in Europe‡	14,114,240	20,200,320	.....

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
IX, 1911	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331
VIII	145,628,521	78,722,418	70,485,150
IX	140,089,819	63,460,810	60,264,796

	Visible Stocks		
	United States	Europe	Total
X, 1911	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX	46,701,374	113,568,000	160,269,374
X	63,065,587	107,408,000	170,473,587

below that now. Laramie and Boswyocolo, Van Horn stocks, are being liquidated because of the financial difficulties of certain of the management. It is reported that the Nevada Douglas will shortly start dividend payments at the rate of 50c. per annum.

Assessments

Company	Delinq	Sale	Amt
Andes, Nev.	Sept. 26	Oct. 17	$0.05
Black Bear, Ida.	Sept. 26	Oct. 26	0.01
Black Horse, Ida.	Oct. 18	Nov. 8	0.01
Black Jack, Utah.	.....	.....	0.01½
Bullion, Nev.	Oct. 16	Nov. 6	0.03
Columbus Extension, Utah.	Sept. 30	Oct. 23	0.02½
Eagle Mt., Ida.	Sept. 23	Oct. 23	0.00½
Eastern Star, Ida.	Oct. 12	Nov. 12	0.002
Empire, Ida.	Sept. 23	Oct. 23	0.002
Exchequer, Nev.	Oct. 30	Nov. 20	0.03
Great Eastern, Ida.	Sept. 28	Oct. 28	0.002½
Hale & Norcross, Nev.	Oct. 3	Oct. 24	0.05
Hypotheek, Ida.	Oct. 14	Nov. 4	0.01
Indiana, Mich.	Oct. 16	.....	1.00
Michigan Cop. & Gold, Utah	Oct. 2	Oct. 22	0.00½
Oneco, Mich.	Oct. 10	.....	1.00
Savage, Nev.	Oct. 2	Oct. 24	0.10
Seg. Belcher, Nev.	Oct. 4	Oct. 25	0.02
Sierra-Nevada, Nev.	Sept. 25	Oct. 16	0.05
Snowshoe, Ida.	Sept. 30	Oct. 30	0.005
Temple, Ida.	Sept. 30	Oct. 30	0.002
Union Con., Nev.	Oct. 15	Nov. 6	0.15
Wabash, Utah.	Sept. 16	Oct. 10	0.05
Wasatch, Utah.	Sept. 27	Oct. 16	0.01
Yellow Jacket, Nev.	Oct. 30	Dec. 3	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63.078	24.567	24.209	29.088
October	55.490	53.340	.....	25.596	24.594	.....
November	55.635	55.719	.....	25.680	25.649	.....
December	54.428	54.905	.....	25.160	25.349	.....
Year	53.486	53.304	.....	24.670	24.592	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.189	.....	12.370	.....	55.170	.....
November	12.616	.....	12.769	.....	57.253	.....
December	13.552	.....	13.768	.....	62.068	.....
Year	12.376	.....	12.634	.....	55.973	.....

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.614	42.962	August	43.319	45.857
March	40.157	42.577	September	39.755	49.135
April	42.185	43.923	October	41.185	.....
May	43.115	46.053	November	43.125	.....
June	44.606	45.815	December	44.655	.....
			Av. Year	42.281	.....

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	4.569	4.406	4.452	14.260	19.679
September	4.485	5.048	4.356	4.924	14.744	22.292
October	4.265	.....	4.139	.....	15.332	.....
November	4.298	.....	4.181	.....	15.821	.....
December	4.450	.....	4.332	.....	15.648	.....
Year	4.420	.....	4.286	.....	13.970	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5.869	7.454	5.719	7.313	27.750	27.048
October	6.102	.....	5.951	.....	27.256	.....
November	6.380	.....	6.223	.....	26.795	.....
December	6.301	.....	6.151	.....	26.849	.....
Year	5.758	.....	5.608	.....	25.281	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90	16.86	13.57	16.03	14.40	15.63
October	15.43	.....	13.44	.....	14.34	.....
November	14.92	.....	13.30	.....	14.25	.....
December	15.15	.....	13.10	.....	13.90	.....
Year	$15.72	.....	$13.94	.....	$14.49	.....

STOCK QUOTATIONS

COLO. SPRINGS Oct. 8

Name of Comp.	Bid.
Acacia	.04
Cripple Cr'k Con.	.01½
C. K. & N.	.18
Doctor Jack Pot	.06
Elkton Con.	.65½
El Paso	1.16
Findlay	.05
Gold Dollar	.18½
Gold Sovereign	.02
Isabella	.19
Jack Pot	.05
Jennie Sample	.06½
Lexington	.007
Moon Anchor	.007
Old Gold	.03
Mary McKinney	.72
Pharmacist	.01½
Portland	1.05
Vindicator	.87¼
Work	.01

SALT LAKE Oct. 8

Name of Comp.	Bid.
Beck Tunnel	.09
Black Jack	.08
Cedar Talisman	.01½
Colorado Mining	.10
Columbus Con.	.10
Crown Point	.02
Daly-Judge	‡5.80
Grand Central	.60
Iron Blossom	1.20
Little Bell	‡.20
Lower Mammoth	.06
Mason Valley	11.75
May Day	.14
Nevada Hills	1.75
New York	‡.02½
Prince Con	1.65
Silver King Coal'n	2.95
Sioux Con.	.04½
Uncle Sam	‡.10
Yankee	‡.12

TORONTO Oct. 8

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.45	Foley O'Brien	.20
Hudson Bay	63.00	Hollinger	14.60
Temiskaming	.37	Imperial	.03
Wettlaufer-Lor.	.34	Pearl Lake	.23
Am. Goldfield	‡.50	Porcu. Gold	.21
Apex	.02½	Preston E. D.	.03
Crown Chartered	.06½	Rea	.25
Dobie	‡.20	Standard	.01
Dome	23.50	Swastika	.10
Dome Exten.	.13¾	West Dome	.15

SAN FRANCISCO Oct. 8

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	9.96
Belcher	.25	Jim Butler	.74
Best & Belcher	.04	MacNamara	.22
Caledonia	1.27½	Midway	.53
Challenge Con.	.05	Mont.-Tonopah	2.27½
Chollar	.02	North Star	.40
Confidence	.40	West End Con.	1.65
Con. Virginia	.37	Atlanta	.16
Crown Point	.25	Booth	.06
Gould & Curry	.01	C.O.D. Con.	.08
Hale & Norcross	.12	Comb. Frac.	.12
Mexican	‡2.42½	Jumbo Extension	.35
Occidental	.70	Pitts.-Silver Peak	.90
Ophir	.52	Silver Pick	.08
Overman	.70	St. Ives	‡.30
Potosi	.03	Tramp Con.	.09
Savage	.10	Argonaut	2.00
Sierra Nevada	.20	Bunker Hill	‡4.50
Union Con.	.37	Central Eureka	.25
Yellow Jacket	.24	So. Eureka	‡2.90

N. Y. EXCH. Oct. 8

Name of Comp.	Clg.
Amalgamated	90⅞
Am. Agri. Chem.	59
Am.Sm.&Ref.,com	87⅞
Am. Sm. & Ref., pf.	108½
Am. Sm. Sec., pf. B	86¾
Anaconda	46½
Batopilas Min.	1¾
BethlehemSteelpf	79
Chino	43¼
Federal M. & S., pf.	48⅝
Goldfield Con.	2⅝
GreatNor.,ore,ctf.	49¾
Guggen. Exp.	58½
Homestake	99
Inspiration Con.	20
Miami Copper	29⅛
Nat'nalLead,com.	67⅛
National Lead, pf.	109
Nev. Consol.	22⅛
Phelps Dodge	215½
Pittsburg Coal, pf.	96½
Ray Con.	22⅝
Republic I&S,com.	34
Republic I & S, pf.	91¾
SlossSheffi'd,com.	57
Sloss Sheffield, pf.	95¼
Tennessee Copper	44⅝
Utah Copper	65
U. S. Steel, com.	78¾
U. S. Steel, pf.	115½
Va. Car. Chem.	47

N. Y. CURB Oct. 8

Name of Comp.	Clg.
Barnes King	‡.78
Beaver Con.	.40
Braden Copper	.7
B. C. Copper	4⅜
Buffalo Mines	1⅞
Caledonia	.40
Con. Ariz. Sm.	⅝
Davis-Daly	2⅛
Diam'field-Daisy	.7
Ely Con.	.21
Florence	.78
Giroux	4¾
Gold Hill Con.	⅛
Greene Cananea	10⅛
Greenwater	.04
Internat. S. & R.	‡124
Kerr Lake	2¾
Keystone	1⅞
La Rose	2⅛
McKinley-Dar-Sa.	1⅛
Min. Co. of A. new	3
Motherlode Gold	‡⅛
Nev. Utah M. & S.	‡.01
Nipissing Mines	8¾
Ohio Copper	1⅛
Pacific Sm. & M.	⅛
South Live Oak	2
South Utah M. & S.	⅛
Standard Oil (Old)	1110
Stand'd Oil of N.J.	398
Stewart	1¾
Tonopah	6⅛
Tonopah Ex.	2⅛
Tonopah Merger	1⅛
Tri-Bullion	⅞
Tularosa	¾
Union Mines	‡⅛
United Cop., pfd.	10
Yukon Gold	3 1/16

LONDON Oct. 9

Name of Com	Clg.
Camp Bird	£1 8s 0d
Dolores	1 10 0
El Oro	0 15 0
Esperanza	1 18 3
Mexico Mines	7 0 0
Oroville	0 5 3
Stratton'sInd.	0 3 1½
Tomboy	1 7 0

BOSTON EXCH. Oct. 8

Name of Comp.	Clg.
Adventure	‡7
Ahmeek	345
Algomah	3
Allouez	46
Am. Zinc	34⅛
Ariz. Com., ctfs.	4⅝
Bonanza	‡.40
Boston & Corbin	7⅛
Butte & Balak	3⅝
Calumet & Ariz.	82
Calumet & Hecla	595
Centennial	22⅛
Cliff	4⅛
Copper Range	59¾
Daly West	4
East Butte	16⅜
Franklin	8⅛
Granby	63¾
Hancock	28
Hedley Gold	20
Helvetia	.75
Indiana	14½
Island Cr'k, com.	56
Island Cr'k, pfd.	88
Isle Royale	35½
Keweenaw	2¼
Lake	35⅜
La Salle	5⅛
Mass	7
Michigan	1¾
Mohawk	68
New Arcadian	‡3
New Idria Quick	7⅜
North Butte	38¼
North Lake	3⅞
Ojibway	4⅜
Old Dominion	63½
Osceola	114
Quincy	88½
Shannon	15⅜
Shattuck-Ariz.	28
Superior	46½
Superior & Bost.	1⅝
Tamarack	46
Trinity	4¾
Tuolumne	2⅛
U. S. Smelting	49¼
U. S. Smelt'g, pf.	52
Utah Apex	2
Utah Con.	12½
Victoria	‡2¾
Winona	5¼
Wolverine	79
Wyandot	‡2

BOSTON CURB Oct. 8

Name of Comp.	Last
Alaska Gold M.	9⅛
Bingham Mines	5⅛
Boston Ely	1⅛
Boswyocolo	01⅛
Butte Central	7⅛
Cactus	10
Calaveras	2⅜
Chief Cons	1 1/16
Corbin	.23
Cortez	.75
Crown Reserve	3½
First Nat. Cop.	1⅛
Majestic	.45
Mazatan	‡⅛
Moneta Porc.	‡.03
Nevada-Douglas	3⅛
New Baltic	2
Oneco	1⅛
Raven Copper	‡
Rhode Island Coal	‡10
San Antonio	‡3
Smokey Dev.	2⅞
S. W. Miami	5⅛
South Lake	7
Trethewey	.35
United Verde Ext.	.41

‡Last quotation.

Mining Companies—United States

Name of Company and Situation		Shares Issued	Shares Par Val	Dividends Total to Date	Dividends Latest Date	Dividends Latest Amt
Acacia, g.	Colo.	1,438,989	$ 1	$ 129,618	Jan. '11	$0.01
Adams, s.l.c.	Colo.	80,000	10	778,000	Dec. '09	0.04
Ahmeek, c.	Mich.	50,000	25	700,000	July '12	5.00
Alaska Mexican, g.	Alas.	180,000	5	3,039,381	Aug. '12	0.35
Alaska Treadwell, g.	Alas.	200,000	25	12,510,000	Aug. '12	0.75
Alaska United, g.	Alas.	180,200	5	1,072,190	Aug. '12	0.50
Am. Zinc, Lead & Sm.	U. S.	165,360	25	855,680	July '12	0.50
Anaconda, c.	Mont.	4,332,500	25	65,171,250	July '12	0.50
Argonaut, g.	Cal.	200,000	5	1,200,000	June '10	0.05
Arizona Copper, pf.	Ariz.	1,426,120	1.20	2,003,391	May '12	0.047
Arizona Copper, com.	Ariz.	1,519,896	1.20	14,691,796	July '12	0.30
Bagdad-Chase, g., pf.	Cal.	84,819	5	202,394	Jan. '09	0.10
Baltic, c.	Mich.	100,000	25	7,050,000	June '11	5.00
Bingham N. H., c.	Utah	228,690	5	294,219	July 12	0.10
Bonanza Dev., g.	Colo.	300,000	1	1,425,000	Oct. '11	0.20
Bunker Hill Con., g.	Cal.	200,000	1	646,000	Aug. '12	0.07½
Bunker Hill & Sul., l.s.	Ida.	327,000	10	13,715,550	Sept. '12	0.20
Butte & Ballaklava, c.	Mont.	250,000	10	125,000	Aug. '10	0.50
Caledonia, l.s.c.	Ida.	1,300,000	1	52,000	June '10	0.01
Calumet & Arizona, c.	Ariz.	596,353	10	15,478,118	Sept. '12	1.00
Calumet & Hecla, c.	Mich.	100,000	25	118,850,000	Sept. '12	12.00
Camp Bird, g.s.	Colo.	1,100,000	5	8,383,562	July '12	0.24
Centen'l-Eur., l.s.g.c.	Utah	100,000	5	3,450,000	Apr. '12	1.50
Center Creek, l.z.	Mo.	100,000	10	440,000	July '12	0.05
Champion, c.	Mich.	100,000	25	7,300,000	Sept. '12	1.00
Cliff, g.	Utah	300,000	1	90,000	Feb. '12	0.10
Cliff, g.	Alas.	100,000	1	140,000	May '11	0.25
Colo. Gold Dredging	Colo.	100,000	10	150,000	Aug. '12	0.25
Colorado, l.s.g.	Utah	1,000,000	0.20	2,570,000	June '12	0.03
Columbus Con., g.s.	Utah	285,540	5	226,832	Oct. '07	0.20
Commercial Gold	Ore.	1,750,000	1	43,750	Dec. '10	0.00½
Con. Mercur., g.	Utah	1,000,000	1	3,415,313	July '12	0.03
Continental, z. l.	Mo.	22,000	25	275,000	July '12	0.50
Copper Range Con., c.	Mich.	393,445	100	12,709,988	July '12	0.50
Daly Judge, s.l.	Utah	300,000	1	360,000	July '12	0.15
Daly West, s.l.	Utah	180,000	20	6,538,000	July '12	0.30
Doctor Jackpot, g.	Colo.	3,000,000	0.10	90,000	Mar. '11	0.00½
Doe Run, l.	Mo.	65,782	100	3,139,176	Sept. '12	1.50
Elkton Con., g.	Colo.	2,500,000	1	2,991,960	May '12	0.01
El Paso, g.	Colo.	490,000	5	1,548,295	June '12	0.01
Fed. M. & S., com.	Idaho	60,000	100	2,708,750	Jan. '09	1.50
Fed. M. & S., pf.	Idaho	120,000	100	7,391,250	Sept. '12	1.50
Florence, g.	Nev.	1,050,000	1	840,000	Apr. '11	0.10
Frances-Mohawk, g.	Nev.	912,000	1	546,000	Jan. '08	0.05
Free Coinage, g.	Colo.	10,000	100	180,000	Dec. '09	1.00
Fremont Con., g.	Calif.	200,000	2.50	158,000	Sept. '12	0.02
Frontier, z.	Wis.	1,250	100	141,272	Sept. '12	2.00
Gemini-Key'ne, l.g.s.	Utah	5,000	100	2,130,000	Oct. '11	6.00
Gold Chain, g.	Utah	1,000,000	1	40,000	Sept. '12	0.02
Gold Coin of Victor	Colo.	1,000,000	1	1,350,000	Feb. '09	0.02
Gold Dollar Con.	Colo.	2,500,000	0.10	87,500	Sept. '12	0.00½
Gold King Con., g.	Colo.	5,750,370	1	1,407,319	Dec. '11	0.03
Golden Cycle, g.	Colo.	1,500,000	5	2,100,000	Sept. '12	0.02
Golden Star, g.	Ariz.	400,000	5	140,000	Mar. '10	0.05
Goldfield Con., g.	Nev.	3,558,367	10	22,771,322	July '12	0.30
Grand Central, g.	Utah	500,000	1	1,445,750	Aug. '12	0.05
Granite, g.	Colo.	1,650,000	1	253,000	Dec. '10	0.01
Hazel, g.	Cal.	900,000	1	864,000	July '12	0.01
Hecla, l.s.	Idaho	1,000,000	0.25	2,560,000	Sept. '12	0.05
Hercules, l.s.	Idaho	1,000,000	1	3,650,000	July '11	0.06
Homestake, g.	S. D.	218,400	100	28,522,040	Sept. '12	0.50
Horn Silver, l.s.z.	Utah	400,000	25	5,662,000	Sept. '07	0.05
Iowa, g.s.l.	Colo.	1,666,667	1	200,166	June '11	0.00½
Iowa-Tiger Leasing g.s.	Colo.	12,655	1	13,921	Jan. '12	0.10
Iron Blossom, s.l.g.	Utah	1,000,000	0.10	1,270,000	July '12	0.10
Iron Silver, s.l.g.	Colo.	500,000	20	4,500,000	Jan. '12	0.10
Jamison, g.	Cal.	390,000	10	378,300	Jan. '11	0.02
Jerry Johnson, g.	Colo.	2,500,000	0.10	150,000	Aug. '11	0.01
Kendall, g.	Mont.	500,000	5	1,375,000	Jan. '12	0.02
Kennedy, g.	Cal.	100,000	100	1,831,001	Apr. '10	0.03
King of Arizona, g.	Ariz.	200,000	1	396,000	Aug. '09	0.12
Klar Piquett, z.l.	Wis.	20,000	1	147,500	Sept. '12	0.25
Knob Hill, g.	Wash.	1,000,000	1	45,000	May '12	0.00½
Liberty Bell, g.	Colo.	130,551	5	522,093	Oct. '10	1.00
Little Bell, l.s.	Utah	300,000	1	75,000	Mar. '11	0.05
Little Florence, g.	Nev.	1,000,000	1	430,000	Jan. '08	0.03
Mammoth, g.s.c.	Utah	400,000	25	2,220,000	Mar. '08	0.05
Mary McKinney, g.	Colo.	1,309,252	1	959,826	July '12	0.02
May Day, g.s.l.	Utah	800,000	0.25	108,000	Sept. '08	0.01½
Mexican, g.s.	Nev.	201,600	2.50	20,160	Aug. '11	0.10
Miami, c.	Ariz.	664,993	5	664,993	Aug. '12	0.50
Modoc, g.s.	Colo.	500,000	1	275,000	Dec. '11	0.01
Mohawk M. Co.	Mich.	100,000	25	2,675,000	Aug. '12	2.50
Monarch-Mad'a, g.s.l.	Colo.	1,000,000	1	40,000	May '11	0.01
Montana-Tonop., s.g.	Nev.	921,865	1	430,000	June '12	0.10
Mountain, c.	Cal.	250,000	25	4,216,250	May '08	0.44
National, g.	Nev.	750,000	1	570,000	May '11	0.10
Nevada Con., c.	Nev.	1,999,394	5	8,977,870	Sept. '12	0.37½
New Century, z.l.	Mo.	330,000	1	237,600	Oct. '09	0.01
New Idria, q.	Cal.	100,000	5	1,600,000	July '12	0.30
North Butte, c.	Mont.	410,000	15	10,248,000	July '12	0.50
North Star, g.	Cal.	250,000	10	3,661,989	Sept. '12	0.30
Old Domin'n, M. & Sm.	Ariz.	162,000	25	2,351,000	July '12	1.25
Ophir, s. g.	Nev.	201,600	3	2,068,360	Jan. '12	0.10
Opohongo, g.s.l.	Utah	898,978	0.25	44,948	July '12	0.02
Oroville Dredging	Cal.	700,000	5	1,383,036	Dec. '09	0.12½
Osceola, c.	Mich.	96,150	25	10,593,200	July '12	6.00
Parrot, c.	Mont.	229,850	10	7,114,942	Aug. '12	0.15
Pearl Con., g.	Wash.	1,909,711	0.05	181,422	Dec. '10	0.02
Pharmacist, g.	Colo.	1,500,000	1	87,500	Feb. '10	0.00½
Pioneer, g.	Alas.	5,000,000	1	4,041,526	Oct. '11	0.03
Pittsburgh-Idaho, l.	Ida.	803,000	1	184,690	Aug. '12	0.04
Pittsburgh Silver Peak, g.	Nev.	2,900,000	1	288,000	July '12	0.16
Portland, g.	Colo.	3,000,000	1	9,097,080	July '12	0.02
Quilp	Wash.	1,500,000	1	67,500	Feb. '12	0.01
Quincy, c.	Mich.	110,000	25	20,363,000	Sept. '12	1.25
Republic, g.	Wash.	1,000,000	1	85,000	Dec. '10	0.01½
Rochester, l.z.	Mo.	4,900	100	188,396	Dec. '10	0.50
Round Mountain, g.	Nev.	866,426	1	328,404	Sept. '10	0.04
Seven Troughs Coal. g.	Utah	1,500,000	1	37,500	July '12	0.02½
St. Joseph, l.	Mo.	1,000,000	10	8,408,357	Sept. '12	0.15

Mining Companies—United States—(*Continued*)

Name of Company and Situation		Shares Issued	Shares Par Val	Dividends Total to Date	Dividends Latest Date	Dividends Latest Amt
Shannon, c.	Ariz.	300,000	$10	$ 450,000	July '07	$0.50
Shattuck-Arizona, c.	Ariz.	350,000	10	1,050,000	Jan. '11	1.00
Silver King Coal. l.s.	Utah	1,250,000	5	1,659,885	Jan. '10	0.15
Sioux Con., s.l.g.	Utah	745,389	1	872,097	July '11	0.04
Skidoo, g.	Cal.	1,000,000	5	275,000	May '12	0.02½
Smuggler, l.s.z.	Colo.	1,000,000	1	2,235,000	Nov. '06	0.03
Snowstorm, c.g.	Ida.	1,500,000	1	1,034,655	July '12	0.02
South Eureka, g.	Calif.	299,981	1	366,881	Apr. '12	0.07
Standard Con., g.s.	Cal.	178,394	10	5,229,809	Jan. '12	0.10
Stratton's Ind., g.	Colo.	1,000,000	0.60	364,500	Apr. '12	0.06
Success, s.	Ida.	1,500,000	1	835,000	Sept. '12	0.03
Superior & Pitts., c.	Ariz.	1,499,793	10	3,089,574	Sept. '12	0.30
Tamarack, c.	Mich.	60,000	25	9,420,000	July '07	4.00
Tennessee, c.	Tenn.	200,000	25	3,106,520	Aug. '12	1.00
Tomboy, g. s.	Colo.	300,000	4.85	2,843,100	Dec. '11	0.24
Tom Reed, g.	Ariz.	909,555	1	736,824	Aug. '12	0.05
Tonopah Belm't, s.g.	Nev.	1,500,000	1	3,218,003	July '12	0.25
Tonopah Ext., g.s.	Nev.	943,433	1	306,615	July '12	0.02½
Tonopah of Nev., s.g.	Nev.	1,000,000	1	9,250,000	July '12	0.40
Tri-Mountain, c.	Mich.	100,000	25	950,000	Dec. '10	1.00
Tuolumne, c.	Mont.	800,000	1	360,000	Aug. '11	0.15
Uncle Sam, g. s. l.	Utah	500,000	1	495,000	Sept. '11	0.05
United Cop. Min., c.	Wash.	1,000,000	1	20,000	Sept. '12	0.01
United (Crip. Ck.) g.	Colo.	4,000,100	1	440,435	Jan. '10	0.04
United Globe, c.	Ariz.	23,000	10	667,000	July '12	4.50
United Verde, c.	Ariz.	300,000	10	30,997,000	Sept. '12	0.75
Utah, s.l.	Utah	100,000	10	325,000	Dec. '10	0.02
Utah, c.	Utah	1,562,599	10	15,057,453	Sept. '12	0.75
Utah Con., c.	Utah	300,000	5	7,200,000	May '12	0.50
Valley View, g.	Colo.	1,000,000	1	240,000	Dec. '10	0.04
Victoria, g.s.l.	Utah	250,000	1	207,500	Mar. '10	0.04
Vindicator Con., g.	Colo.	1,500,000	1	2,542,500	July '12	0.03
Wasp No. 2, g.	S. D.	500,000	1	351,966	Sept. '12	0.02
Wellington Mines, g.	Colo.	10,000,000	1	200,000	July '12	0.00½
Wolverine, c.	Mich.	60,000	25	7,140,000	Apr. '12	5.00
Work, g.	Colo.	1,500,000	1	172,500	July '08	0.00½
Yak, s.l.	Cclo.	1,000,000	1	1,417,685	Oct. '10	0.04
Yankee Con., g.s.	Utah	1,000,000	1	182,500	July '07	0.01½
Yellow Aster, g.	Cal.	100,000	10	1,081,789	Jan. '12	0.05
Yellow Pine, g.	Nev.	950,000	1	47,500	Aug. '12	0.02
Yukon Gold, g.	Alas.	3,500,000	5	4,210,000	Sept. '12	0.07½

Coal, Iron, Industrial and Holding Companies

Amalgamated, c.	Mont.	1,538,879	$100	$69,734,840	Aug. '12	$1.00
Am. Sm. & Ref., com.	U. S.	500,000	100	23,208,333	Sept. '12	1.00
Am. Sm. & Ref., pf.	U. S.	500,000	100	41,708,333	Sept. '12	1.75
Am. Smelters, pf. A	U. S.	170,000	100	6,855,000	July '12	1.50
Am. Smelters, pf. B	U. S.	300,000	100	10,232,000	July '12	1.25
Cambria Steel	Penn.	900,000	50	15,647,500	Aug. '12	0.62½
Consolidation Coal	Md.	190,247	100	20,533,894	July '12	1.50
Greene Cananea	U. S.	2,471,314	25	1,237,656	Aug. '12	0.25
Guggenheim, Expl.	U. S.	207,933	100	14,170,153	July '12	2.50
Inter'l Nickel, com.	U. S.	115,826	100	6,296,671	Sept. '12	7.00
Inter'l Nickel, pfd.	U. S.	89,126	100	3,609,500	Aug. '12	1.50
Inter'l Sm & Ref.	U. S.	100,000	100	2,500,000	Aug. '12	2.00
Lehigh Coal & Nav.	Penn.	482,956	50	22,052,156	Aug. '12	1.00
National Lead, com.	N. Y.	206,554	100	7,021,650	Sept. '12	0.75
National Lead, pf.	N. Y.	243,676	100	25,429,765	Sept. '12	1.75
Old Dominion, c.	Ariz.	293,245	25	2,846,735	July '12	1.00
Phelps, Dodge & Co.	U. S.	450,000	100	20,459,304	Sept. '12	2.50
Pittsburgh Coal, pf.	Penn.	297,010	100	15,137,583	July '12	1.25
U. S. Steel Corp., com.	U. S.	5,083,025	100	168,988,726	Sept. '12	1.25
U. S. Steel Corp., pf.	U. S.	3,602,811	100	313,549,063	Aug. '12	1.75
U. S. S., R. & M., com.	U.S.-Mex.	486,320	50	4,255,538	July '12	0.50
U. S. Sm., R. & M., pf.	U.S.-Mex.	351,205	50	10,837,575	July '12	0.87½

Canadian, Mexican and Central American Companies

Ajuchitlan, g.s.	Mex.	50,000	$ 5	$ 187,500	July '12	$0.25
Amparo, g.s.	Mex.	2,000,000	1	860,000	Aug. '12	0.03
B. C. Copper	B. C.	591,709	5	437,886	July '12	0.15
Beaver Con., s.	Ont.	1,996,490	1	289,901	July '12	0.03
Buffalo, s.	Ont.	1,000,000	1	1,480,000	Aug. '12	0.05
Cobalt Townsite, s.	Ont.	1,000,000	1	150,000	May '12	0.05
Coniagas, s.	Ont.	800,000	5	3,800,000	Aug. '12	0.30
Crown Reserve, s.	Ont.	1,768,814	1	4,333,595	Sept. '12	0.05
Crow's Nest Pass C. Co.	B. C.	248,506	25	2,182,864	Mar. '11	0.25
Dominion Coal, com.	N. S.	150,000	100	5,400,000	July '12	1.00
Dominion Coal, pf.	N. S.	50,000	100	4,915,000	Aug. '12	3.50
Dos Estrellas, g.s.	Mex.	300,000	0.50	7,030,000	Sept. '12	2.50
El Oro, g.s.	Mex.	1,147,500	4.85	8,576,406	July '12	0.24
Esperanza, s.g.	Mex.	455,000	4.85	10,835,127	June '12	0.36
Granby, s.l.c.	B. C.	148,496	100	4,197,111	Dec. '10	1.00
Greene Con., c.	Mex.	1,000,000	10	7,194,400	Aug. '12	0.40
Guanajuato D., pf., s.	Mex.	10,000	1000	274,356	Jan. '11	3.00
Hedley Gold	B. C.	120,000	10	684,000	Sept. '12	0.30
Kerr Lake s.	Ont.	600,000	5	4,170,000	Sept. '12	0.25
La Rose Con., s.	Ont.	1,498,407	5	2,951,851	July '12	0.12½
Le Roi No. 2, g.	B. C.	120,000	24.30	1,428,840	July '12	0.24
Lucky Tiger Com., g.	Mex.	715,337	10	1,482,202	Sept. '12	0.05
McK.-Dar. Sav. s.	Ont.	2,247,692	1	2,607,320	July '12	0.10
Mines Co. of Am. (new)	Mex.	1,700,000	10	*877,500	Jan. '12	0.15
N. Y. & Hond. Ros.	C. A.	150,000	10	3,082,500	Mar. '12	0.15
Nipissing, s.	Ont.	1,200,000	5	8,640,000	July '12	0.37½
Peñoles, s.l.g.	Mex.	80,000	25	5,910,688	Sept. '12	1.25
Peregrina M. & M., pf.	Mex.	10,000	100	328,656	Sept. '10	3.50
Pinguico, pf., s.	Mex.	20,000	100	600,000	Oct. '11	3.00
Right of Way Mnsts.	Ont.	1,685,500	1	202,260	Dec. '11	0.02
Rio Plata, s.	Mex.	373,437	5	354,990	Mar. '12	0.10
San Rafael, g.s.	Mex.	2,400	25	1,437,624	Jan. '12	2.00
San Toy, g.s.	Mex.	6,000,000	1	360,000	Dec. '11	0.10
Sopresa, g.s.	Mex.	19,200	20	1,517,438	Jan. '11	34.00
Stand'd Silver-Lead	B. C.	2,000,000	1	275,000	Sept. '12	0.02½
Temiskaming, s.	Ont.	2,500,000	1	1,159,155	July '12	0.03
Tem. & Hud. Bay, s.	Ont.	7,761	1	1,659,854	Aug. '12	3.00
Trethewey, s.	Ont.	1,000,000	1	861,998	July '12	0.10
Wettlaufer-Lorrain, s.	Ont.	1,416,590	1	424,977	July '12	0.05

*Previous to reorganization, $5,258,881.
†Previous to January, 1910, $324,344.

INDUSTRIALS

The Pequest Co., Buttzville, N. J., have ordered a second dryer from the Ruggles-Coles Engineering Co., 50 Church St., New York, for drying iron ore.

The Chas. A. Schieren Co., 30 Ferry St., New York City, are putting out a solid bronze desk pin tray as a souvenir . They announce that any mining engineer can have one for the asking.

J. W. Stonehouse, Victor, Colo., has installed his enameled steel signals in a large number of mines recently and it is reported that this new way of doing an old thing is greatly appreciated by the users.

The D. T. Williams Valve Co:, announces that they are just putting out a new gate valve, the "Cino," at a moderate price. It is said to have a wide range of uses in mining work up to 100 lbs. pressure.

The Denver Fire Clay Co., Denver, Colo., has just issued a cloth-bound catalog for 1913, consisting of 530 pages, fully illustrated. Assayers and chemists will value the book for reference purposes. This company has also issued a bulletin on Case Gas Furnaces for assaying and smelting and the proper heat treatment of metals.

The Western Electric Co. reports that its earnings continue to run close to the forecast of the showing for this year made soon after the new year began. It was then figured that 1912 ought to yield a gross business of something like $67,000,000. Returns for the eight months ended with August give an indicated gross business for the year of approximately $68,000,000.

Walter B. Snow, publicity engineer, 170 Summer Street, Boston, Mass., has added to his staff Chester R. Ross, who will act as manager of the addressing and mailing department. Mr. Ross brings to this position an extended experience covering three years with the Griffin Wheel Co., four years with the Boston Transcript, and a considerable period as salesman in various lines of industry.

The Braden Copper Company of Chili has given the Hardinge Conical Mill Company an additional and repeat order for twelve more 8-foot Hardinge Pebble Mills, making a total of sixteen now on hand or on order for this company. Also that the Teziutlan Copper Company has placed an order for four similar sized Hardinge Mills. These mills are for semi-fine grinding, i.e., to pass about 60 mesh.

The George M. Newhall Engineering Company are in receipt of an order from the Pennsylvania Railroad Company for 10 wrecking cranes, 120 tons capacity each, with special features specified by the railroad company. Cranes to be manufactured by the Industrial Works of Bay City, Mich. This is said to be the first order for equipment of this character placed by the Pennsylvania Railroad Company for several years.

A new advertising firm has been formed in New York City under the name of Wightman & Richards, Technical Department of Jos. A. Richards & Staff, General Advertising Agents, Tribune Building. This firm represents the association of Joseph A. Richards, Lucius I. Wightman, and Paul Morse Richards. The association is formed in recognition of the fact that advertising is salesmanship and that the most efficient marketing of any product demands a unifying, rather than a separation, of advertising and selling efforts.

The new firm should do much to advance the cause of profitable advertising, by carrying out the plans they have mapped out.

Lockwood, Greene & Co., architects and engineers for industrial plants, have removed their Boston offices from 93 Federal Street to 60 Federal Street, where they occupy the seventh, eighth, and ninth floors of the new First National Bank Building. The new offices will provide better facilities for handling the increasing business of this concern, including the design of industrial plants, investigation and design of water power developments, steam, water and electric power plant tests and the valuation and reorganization of existing plants, as well as acting in the capacity of permanent consulting engineers for many industrial concerns.

The Rateau Steam Regenerator Company has been awarded an order by the Inland Steel Company for a complete equipment of Rateau Steam Regenerators. The regenerator equipment will handle the exhaust steam from two mill engines at the Indiana Harbor plant of the Inland Steel Company, and will deliver the steam to two low-pressure turbines of 2000 kw. each. The Rateau Steam Regenerator Company has granted a license to the Ingersoll-Rand Company to manufacture the patented Rateau regulator for mixed flow turbines. The General Electric Company, the Southwark Foundry & Machine Company and the Ridgway Dynamo & Engine Company have been for some time manufacturing under a similar license from the Rateau Steam Regenerator Company.

The Wells-Lloyd Co., Menominee, Mich., has a machine at work for the manufacture of steel tubing, patents for which were issued on the 28th of May last. It is said to be the first automatic machine for the manufacture of steel tubing in the world. The metal as produced from the mills in flat form is placed on one end of the machine in the form of a roll. The machine forms the stock into round, square or other shapes, fuses the metal together, or welds with oxygen and acetylene gases, draws the welded tube to exact size and perfect shape, straightens it, and finally cuts it to any desired length, without stopping the movement of the tube through the machine. In other words the tube is finished from flat stock ready to be shipped, without the intervention of a human hand.

The Dodge Manufacturing Company has opened a branch store and warehouse at 14th and Lovejoy Sts., Portland, Ore., where a complete stock of Dodge power transmission machinery and appliances will be carried in stock. The branch will be under the management of Charles A. Barnard, formerly vice-president of the Barnard & Leas Manufacturing Company, Peoria, Ill., and an engineer of wide experience in mill equipment. Besides the Dodge line, the Portland branch will have the northwestern sales agency for the well known line of flouring mill machinery manufactured by the Wolfe Company, Chambersburg, Pa., Mr. Barnard's long experience in the design and manufacture of flour mill machinery, elevating, conveying and power transmission machinery insures to the mills and other power using plants of Oregon and Washington a real service in an engineering capacity on their requirements in these lines. This makes the tenth branch opened by the Dodge people and Portland is added to the list in pursuance to a demand. Branches are now maintained at Minneapolis, Philadelphia, Pittsburgh, Chicago, St. Louis, Atlanta, Cincinnati, New York, Boston, and in connection with these several hundred dealers throughout the country carry the full line in stock.

The Taylor Iron & Steel Company announces the acquisition of the Wm. Wharton Jr. & Co., Inc., at Philadelphia, Penn. with works at Philadelphia and Jenkintown, Penn., and its subsidiary corporation, the Philadelphia Roll & Machine Company. The Taylor Company and the Wharton Company have both had a successful history of more than fifty years. During the past eighteen years the business of each company has been largely supplemental to the other in the manufacture and application of manganese Steel. The Taylor Iron & Steel Company has in recent years devoted itself to the manufacture of steel castings of a special high-grade nature. Of these specialties, TISCO Manganese Steel is the principal one. The Wharton Company manufacture switches, crossings, special rails and track parts for steam and street railway. Its specialty is the application of TISCO Manganese Steel to these parts. The relation of the Taylor Commany and the Wharton Company have been so close that a unity of interests has been deemed advisable. The Taylor Iron & Steel Company will maintain the corporate indentity of the Wm. Wharton Jr., & Company, Inc., and the Philadelphia Roll & Machine Company, and on October 1, 1912, the Taylor Iron & Steel Company will change its corporate title to the Taylor-Wharton Iron & Steel Company. The organization of the Taylor Iron & Steel Company will become the organization of the Taylor-Wharton Iron & Steel Company, namely: President, Knox Taylor; vice president, A. E. Borie, Prof. H. M. Howe, V. Angerer; secretary & treasurer, W. A. Ingram.

TRADE CATALOGS

Independent Powder Co., Joplin, Mo. Catalog. Dynamite. Illustrated, 156 pages, 5½x7½ inches.

A. S. Cameron Steam Pump Works, 11 Broadway, New York. Booklet, Pumps. Illustrated, 16 pages, 3½x5½ in.

Merrill Metallurgical Co., 143 Second St., San Francisco, Cal. Catalog, Filters, Illustrated, 106 pages, 7½x11 in.

The Hayward Co., 50 Church St., New York. Pamphlet No. 594. Buckets and digging machinery. Illustrated, 8 pages, 6x9 in.

The Curtis & Curtis Co., Bridgeport, Conn. Catalog, Pipe Cutting and Threading Machinery. Illustrated, 32 pages, 7½x10 in.

Sprague Electric Works, 527 W. 34th St., New York. Bulletin No. 902. Electric grab bucket cranes. Illustrated, 24 pages, 8x10½ inches.

Crocker-Wheeler Co., Ampere, N. J. Bulletin No. 149, Form H. Direct current motors and generators. Illustrated, 8 pages, 7½x10 in.

C. W. Hunt Co., West New Brighton, N. Y. Catalog No. 12-1, Industrial Narrow Gauge Railways. Illustrated, 80 pages, 6½x9¼ in.

S. Flory Mfg. Co., Bangor, Penn. Catalog. Hoisting engines, dredging, logging, slate working machinery. Illustrated, 180 pages, 9x12 inches.

Albert J. Kelting, 459 Carroll St., Brooklyn, N. Y. Catalog. Positive pressure blowers, vacuum pumps, exhausters. Illustrated, 6x9 inches.